



Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

<http://www.archive.org/details/newreclamationer19unitrich>

From the collection of the

j f d
y z n
x m k
o PreLinger Library a h
u v q e
b t s w p c

San Francisco, California
2007

I 27.5

1928

vol. 19

no 1-12

U. S. Docs.
Ref.

INDEX NEW RECLAMATION ERA. VOLUME XIX

For the year 1928

Page numbers for separate issues

No.	Month	Pages	No.	Month	Pages
1.	January	1-16	7.	July	97-112
2.	February	17-32	8.	August	113-128
3.	March	33-48	9.	September	129-144
4.	April	49-64	10.	October	145-160
5.	May	65-80	11.	November	161-176
6.	June	81-96	12.	December	177-192

A		Page	C		Page
Aided and directed settlement bills in Congress		38	Bruins, J. F., electricity on an irrigated farm, Boise project		130
Alfalfa, production of high grade		123			
American Falls, Idaho, new town site of		22			
American Society of Civil Engineers, report of committee of irrigation division of		162	Carmody, D. L., reconstruction of Zillah waste-way		5
Apples grown on projects in 1927		94	Cheese industry on North Platte project		13
Appropriation act, fiscal year ending June 30, 1929		55	Cherry crop on Yakima project breaks all records		122
Appropriations available (list), fiscal year 1929		57	Chicken ranch pays, Shoshone project		9
Appropriations, fiscal year 1928, act of March 7, 1928		96	Citrus fruit grown on projects in 1927		62
Arrowrock Dam topped by 362-foot Swiss dam		176	Citrus orchards, syndicate form for development of Yuma project		11
Australia, Murray River irrigation works in		157	Cold-storage facilities in the Yakima Valley, Wash.		121
B			Collections from and obligations of water users on the projects		154
Ball, David E., replacement of portion of Mabton siphon, Sunnyside division, Yakima project		103	Collections from projects are gratifying		108
Batch, Otto C., economic notes from Belle Fourche project		168	Colombia, settlement of waste lands in		20
land settlement on Belle Fourche project		52	Colonization of Riverton project, what it means to Fremont County		158
the cheese industry on the North Platte project		13	Colorado River board organizes		133
Bees, handling of, on Shoshone project		115	commission appointed to study proposed dam site		123
Beets, sugar, grown on projects in 1927		62	development reported favorably to Congress		78
Belle Fourche project, economic notes from		168	silt in, and its relation to irrigation		85
honey production on		14	Conference, Montana Irrigation, considers farm programs and settlement problems		10
land settlement on		52	reclamation settlement, to be held in Washington, D. C., February 14 and 15, 1928		18
Betts, C. A., productive irrigation at Owyhee Dam camp		190	settlement and development, held in Washington, February 14 and 15, 1928		34
Bird refuge, Tule Lake, Calif.		176	Southern Reclamation, December 14-15, 1927		2
Black Canyon diversion dam, Boise project		125	Construction and operation and maintenance collections are gratifying, 1928		108
power and pumping plant, Boise project		30	Construction charges, report of advisers on conditions on projects petitioning for extension of time		8
Boise project, Black Canyon diversion dam		125	Construction collections show great improvement		41
power and pumping plant		30	Contract expanded without readvertisement (Comp. Gen's. decision)		15
Deadwood Dam construction approved		181	Cotton grown on the projects in 1927		49
electricity on an irrigated farm		130			
Boot Hill Cemetery		111			
Boulder Canyon dam site commission		123			
investigation (Pub. Res.)		110			
Brown v. City of Cle Elum, 255 Pac. 961, Washington cities can not exercise police powers outside boundaries		31			

	Page		Page
Crop and livestock census, regulations for taking.....	174	Gila River investigation (legislation).....	111
returns indicate prosperity.....	21	Gopher invasion on irrigation project.....	7
(surplus) problem, solving by cooperation.....	132	Grasshopper control campaigns on Tule Lake lands. Klamath project.....	188
value, cumulative, over billion dollars.....	159	Gravity extension division, Minidoka project, contract with North Side Canal Co.....	91
1927, distribution on the projects and values.....	80	unit approved by President Coolidge.....	116
		Guernsey Dam, North Platte project.....	184
		Guernsey power plant, North Platte project.....	60
D		H	
Dairy cow, influence of, on the payment of charges.....	131	Honey production on Belle Fourche project.....	14
progress on North Platte project.....	23	on Shoshone project.....	115
Dam construction, safety measures taken, illustrated by Stony Gorge Dam.....	71	Houk, Ivan E., Black Canyon diversion dam, Boise project.....	125
Reclamation Bureau, estimated vs. actual cost.....	87	construction of the Willwood diversion dam.....	26
the design and construction of.....	15	Huntley project, educational special trains visit.....	12
Darlington, E. B., turkey antitheft association on the Minidoka project.....	122		
Deadwood Dam construction approved by President Coolidge.....	181	I	
Debler, E. B., secondary project investigations. Deficiency act:	140	India, irrigation in, from Lloyd barrage.....	4
fiscal year 1928 (first).....	47	large canal nearing completion.....	94
fiscal year 1928 (second).....	110	International Water Commission, United States and Mexico.....	46
Designs and estimates, submission of data for.....	104	Iron Canyon project, California.....	90
E		J	
East, the, how it profits from western reclamation.....	39	Jackson, J. F. and Kreutzer, George C., land settlement an essential part of reclamation....	114
Echo Dam, Salt Lake Basin project.....	134	Japan, irrigation in.....	143
Economic aspects of Federal reclamation, address by Doctor Mead, October 4, 1928.....	163	Johnson, H. H., economic conditions and settlement difficulties on Milk River project.....	98
conditions and settlement difficulties on the Milk River project.....	98		
conditions on reclamation projects, advance statement on, by commissioner.....	18	K	
notes from Belle Fourche project.....	168	Kinzie, P. A., standard high-pressure gates.....	44
notes from the irrigation projects (Montana irrigation conference).....	10	Klamath project, grasshopper control.....	188
notes from the irrigation projects. Mint growing on Sunnyside.....	73	Tule Lake Community Club.....	107
notes from the reclamation projects.....	50	Tule Lake lands, economic results on.....	40
Electricity on an irrigated farm, Boise project.....	130	Kreutzer, George C., and Jackson, J. F., land settlement an essential part of reclamation....	114
Extension of time for repayment, report of advisers on economic conditions on petitioning projects.....	8	Kreutzer, George C., settlement and farm development problems of Vale and Owyhee projects.....	178
F		L	
Farms, financing irrigated.....	54	Lamb-feeding demonstration on the Uncompahgre project, Colorado.....	74
Financing irrigated farms.....	54	Land settlement an essential part of reclamation speculation on Federal reclamation projects, curbing.....	151
Fish conservation (legislation).....	111	Law notes.....	47
Fishing grounds, project reservoirs famed as.....	109	State tax on gasoline.....	137
Fish, reclamation reservoirs stocked with.....	89	Legal notes of interest to reclamation projects.....	173
Flow of water in pipes, formulæ for estimating.....	93	relating to the reclamation projects.....	91
Fort Shaw irrigation district, contract with, confirmed by Supreme Court of Montana.....	78	Legislation affecting the projects.....	110
		taxing reclamation entrymen's land (act of April 21, 1928).....	92
G		by Congress, recent (first deficiency act approved December 22, 1927)—	
Galiger v. McNulty (1927), 260 Pac. 401, use of water outside of watershed.....	15	March 28.....	47
Gates, standard high-pressure.....	44	April 28, appropriation act.....	55
Gem irrigation district, sale of State lands in.....	21		

	Page		Page
Linfield, F. B., economic notes from reclamation projects.....	50	North Platte project, cheese industry.....	13
Liquidated damages, extension of time, advertising, acceptance of other than lowest bids, Comptroller General's decision.....	173	dairying results on.....	40
Livestock and crop census, regulations for taking.....	174	dairy progress on.....	23
Livestock and equipment value at beginning of 1928.....	115	fair prize winner.....	176
Lytel, J. L., obligations of, and collections from water users on the projects.....	154	Guernsey Dam.....	184
		Guernsey power plant.....	60
		poultry development on.....	157
		North Side Canal Co., contract with, gravity extension division, Minidoka project.....	91
		O	
Mc		Obligations of and collections from water users on the projects.....	154
McClellan, L. N., Black Canyon power and pumping plant.....	30	Ohashi, Dr. Tashi, irrigation in Japan.....	143
power development, Yuma project.....	170	Okanogan project transfer.....	110
McPhail, H. F., Guernsey power plant.....	60	Operation and maintenance and construction collections are gratifying, fiscal year 1928.....	108
		Orland project, Stony Gorge Dam precautions..	71
M		Owyhee and Vale projects, settlement and farm development problems.....	178
Mabton siphon, Sunnyside division, Yakima project, replacement of.....	103	Owyhee Dam camp, productive irrigation at....	190
Maintenance of irrigation structures.....	29	Owyhee project, design of dam.....	82
Mead, Elwood, address by, at meeting of American Society of Civil Engineers, San Diego, Calif., October 4, 1928.....	163		
advance statement on economic conditions on reclamation projects.....	18	P	
chairman of committee to investigate failure of St. Francis Dam.....	66	The Panhandle Oil Co. v. Mississippi.....	137
the design and construction of dams.....	15	Paradise Valley, Ariz., proposed reclamation of..	142
Mexico and United States, International Water Commission.....	46	Pathfinder Reservoir again a bird reserve.....	90
Milk River project, economic conditions and settlement difficulties on.....	98	Pleasure resorts, storage reservoirs as.....	156
Minidoka gravity extension unit approved by President Coolidge.....	116	Plumb, H. H., enlargement of Minidoka power plant.....	86
Minidoka power plant, enlargement of.....	86	Policy, a national reclamation.....	162
Minidoka project beets make profit for growers..	4	Population, world, area, and irrigated acreage..	93
contract between United States and the North Side Canal Co. gravity extension division.....	91	Potatoes brought this farmer \$70,000 profit....	92
holds fair and seed show.....	191	Poultry development on North Platte project ..	157
turkey antitheft association on.....	122	Poultry plant, cooperative community, Salt Lake Basin project.....	119
Mint growing on Sunnyside division, Yakima..	73	Power development, Yuma project, Arizona-California.....	170
Mirtoff, J. A., reclamation policy in Russia.....	63	Power plant, Minidoka, enlargement of.....	86
Mitchell, L. H., from flying to handling those that fly on Shoshone project.....	115	Preston-Engle report.....	8
Huntington Downer of Deaver, Wyo., makes his chicken ranch pay.....	9	Preston, P. J., the syndicate form for development of citrus orchards, Yuma project.....	11
Montana irrigation conference considers farm programs and settlement problems.....	10		
Montana projects, economic notes from.....	50	R	
		Railroads are helping project settlement.....	15
N		Reclamation fund continues to revolve.....	21
Nalder, W. H., Guernsey Dam, North Platte project.....	184	Reclamation project women and their interests 1928..6, 24, 42, 58, 76, 88, 109, 124, 138, 152, 166, 182	182
submission of data for designs and estimates.....	104	Reclamation settlement and development conference, Washington, D. C., February 14 and 15, 1928.....	34
Newlands dairy cows bring good returns.....	158	Repayments on projects show gain.....	143
New Brunswick v. United States.....	91	Report of advisers on economic conditions on projects petitioning for extension of time....	8
Newell, H. D., and Henderson, C. A., grasshopper control campaigns, Klamath project..	188	Reservoirs of projects famed as fishing grounds..	109
		Rio Grande project time extended (legislation)..	110
		Riverton project, exhibit by W. T. Peyton.....	187
		what its colonization means to Fremont County.....	158
		Russia, reclamation policy in.....	63

S		T	
	Page		Page
St. Francis Dam failure. Report of committee appointed by city council of Los Angeles.....	66	Taxing reclamation entrymen's land (act approved April 21, 1928).....	92
Salt Lake Basin project, cooperative community poultry plant.....	119	Taxation (State) of land which the United States has contracted to sell.....	91
Salt Lake Basin project, Echo Dam.....	134	Tax, State, on gasoline.....	137
Salt River project makes big payment.....	16	Town of Casa, Colorado Land Grant, <i>v.</i> Pooler, 259 Pac. 629, State courts suits against United States officers.....	31
Sanford, George O., settlement and development problems, Sun River project.....	146	Trains, educational special, visit Huntley project.....	12
Savage, J. L., design of Owyhee Dam.....	82	Tule Lake Community Club, Klamath project..	107
Schildknecht, Dr. H., why and how reclamation and settlement in Switzerland are subsidized by the Government.....	120	bird refuge created in California.....	176
Schilling, H. M., educational special trains visit Huntley project.....	12	lands, Klamath project, economic results on.....	40
Sehnurr, Mae A., reclamation project women and their interests.....	6,	Turkey antitheft association on Minidoka project.....	122
24, 42, 58, 76, 88, 109, 124, 138, 152, 166, 182			
Scroggs, Maurice D., mint growing on Sunnyside division, Yakima project.....	73	U	
influence of the dairy cow on the payment of charges.....	131	Uncompahgre project has many prize winners..	5
Secondary project investigations.....	140	lamb-feeding demonstration.....	74
Settlement and development conference, Washington, D. C., February 14 and 15, 1928.....	34	lamb-feeding test.....	40
Settlement and development problems of Milk River, Sun River, and Lower Yellowstone projects, Montana.....	50	V	
Settlement and development problems, Sun River project, Montana.....	146	Vale and Owyhee projects, settlement and farm development problems.....	178
Settlement difficulties and economic conditions on the Milk River project.....	98	Vale irrigation project booklet issued by bureau..	156
Settlement, land, an essential part of reclamation.....	114	W	
Shoshone project, from flying to handling those that fly on the.....	115	Washington cities can not exercise police powers outside boundaries.....	31
Willwood diversion dam.....	26	Water, flow of, in pipes, formulæ for estimating use of outside of watershed.....	93
Silt in the Colorado River and its relation to irrigation.....	85	Widtsoe, John A., success on irrigation projects..	175
Southern Reclamation Conference makes plans for the future.....	2	Williams, C. F., cooperative community poultry plant, Salt Lake Basin project.....	119
Speculation, curbing on Federal reclamation projects.....	151	Willwood diversion dam, construction of.....	26
State has no power to tax a dealer on gasoline....	137	World, population, area and irrigated acreage..	93
Stacy-Schmidt Mfg. Co. <i>v.</i> U. S.....	47	Y	
Steele, B. W., Echo Dam, Salt Lake Basin.....	134	Yakima project, reconstruction of Zillah wasteway.....	5
Stock, live, and equipment value, beginning of 1928.....	115	replacement of portion of Mabton siphon..	103
Stony Gorge Dam, precautions taken for safety..	71	Sunnyside division, mint growing.....	73
Success on irrigation projects, John A. Widtsoe..	175	influence of the dairy cow on the payment of charges.....	131
Sugar-beet farmers enjoy good returns.....	21	Yakima Valley, cold-storage facilities in.....	121
harvest on Belle Fourche project.....	168	Youngblutt, F. C., honey production on the Belle Fourche project.....	14
grown on projects in 1927.....	62	Young, Walker R., Iron Canyon project.....	90
Sun River project, settlement and development problems.....	146	Yuna project, power development on.....	170
Surplus crop problem, solving by cooperation....	132	Syndicate form for development of citrus orchards.....	11
Switzerland, why and how reclamation and settlement are subsidized by the Government.....	120	Z	
		Zillah wasteway reconstruction, Yakima project..	5

NEW RECLAMATION ERA

VOL. 19

JANUARY, 1928

NO. 1



DREDGER CLEANING AN IRRIGATION CANAL



LEGISLATION is desirable for the construction of a dam at Boulder Canyon on the Colorado River, primarily as a method of flood control and irrigation. A secondary result would be a considerable power development and a source of domestic water supply for southern California. Flood control is clearly a national problem, and water supply is a Government problem, but every other possibility should be exhausted before the Federal Government becomes engaged in the power business. The States which are interested ought to reach mutual agreement. This project is in reality their work. If they wish the Federal Government to undertake it, they should not hesitate to make the necessary concessions to each other



*From the Message of the President to Congress
December 6, 1927*

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, to others than project water users, 75 cents a year

HUBERT WORK
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

JANUARY, 1928

No. 1

Interesting High Lights on the Reclamation Projects

THE grapefruit crop of the Mesa division, Yuma project, Arizona, is being gathered. The new orchards planted in the spring of 1923 are yielding their first fruit of any consequence. From 10 acres of the Wohlford estate 2,500 lug boxes of grapefruit have been picked. The crop from the 200-acre holding of the Yuma Mesa Grapefruit Co. was sold at 3.6 cents per pound orchard run on the trees.

THE Yakima Morning Herald states that 973 more auto licenses were issued in Yakima County for the year 1926 than in the preceding year, or a total of 22,850 licenses. The chamber of commerce reports the total population of Yakima County as approximately 70,000, which would make an approximate average of one car to every three persons in the county. Prosperity plus.

EXCAVATION has been finished for the foundations of the Stony Gorge Dam, Orland project. It is anticipated that with favorable weather conditions the dam should be completed well within the time limit of the contract.

A RECENT letter from a librarian asked for our bulletin on "oil and" irrigation project. Our Sherlock Holmes stenographer, without a pause in the rush of business, sent a copy of the new Orland booklet advertising the attractive farms for sale there at reasonable prices and on long terms.

THE Vale Community Club, Belle Fourche project, is organizing for more effective work, and other commercial bodies are taking an active interest in furthering project development. An agricultural short course was held at Nisland early in December under the auspices of the State College extension service to discuss agricultural economics, better livestock, and other phases of farm and home life.

THE Mesa County Turkey Growers' Association has been conducting a very satisfactory sales campaign on the Grand Valley project, and bids fair to become a prosperous organization. Affiliation has been made with the Utah organization, and the local association is being extended to include Montrose and Delta Counties for marketing purposes.

A CHEESE factory has been opened at Montrose. Routes are being established to bring the dairy products to the factory, and it is anticipated that the industry will show a gradual but steady increase with the result that more dairy cows will be brought to the valley.

ORLAND was the first project to send in the results of its 1927 crop census, which showed an increase of \$100,000 in the total value of crops and of \$5 in the per acre value over similar figures for 1926.

PURCHASES from Minidoka project farmers of more than 6,000 tons of hay were made by stockmen during the month. The price paid on the gravity division was \$8 per ton in the stack. Hay is also being delivered to the alfalfa meal mills, which have started grinding.

AN enterprise known as the Merrill Accredited Hatchery has been established near Paul, Minidoka project. An incubator with a capacity of 16,000 eggs has been installed, and an output of 35,000 baby chicks is expected for the coming season.

THE new entrymen on the Tule Lake division, Klamath project, are at work erecting dwellings and other improvements. During the month a number completed this work and moved onto their holdings.

TWO more farms on the Lower Yellowstone project under option to the Bureau of Reclamation have been sold to three Colorado farmers. One of the farms will be divided.

THE Federal Land Bank of Spokane reports that the purchasing power of farm products in its district, comprising the States of Washington, Oregon, Idaho, and Montana, advanced 6 per cent in the first 11 months of 1927. Land sales in this district for November reached a total of \$246,287, compared with \$193,691 for the same month in 1926.

A POTATO marketing association, organized recently in Fremont County, Wyo., has been doing excellent work, marketing all potatoes received at a reasonable price, and securing a material reduction in freight rates to southern points. No Riverton project potatoes were marketed through the association, but its activities will undoubtedly have an important bearing on this crop grown on the project in future years.

ABOUT 130,000 pounds of turkeys were consigned from the Orland project to San Francisco and the bay region just prior to Thanksgiving.

F. W. CRESWELL, who owns and operates 21 acres of producing pecan trees in the Valley division, Yuma project, sent six 1-quart jar exhibits to the annual fair held by the Brazos Valley Pecan Growers' Association at Eastland, Tex. His exhibit won two first prizes, two second prizes, one third, and the champion prize for the best exhibit at the fair. An 8-year old grove properly cared for will pay a 10 per cent annual dividend, net, on a valuation of \$1,500 per acre, figuring pecans at 30 cents a pound.

Southern Reclamation Conference Makes Plans for the Future

Representatives of Southern States meet with officials of the Department of the Interior to discuss results of recent investigations of opportunities for planned group settlement and to plan for continuing the work

THE representatives of seven Southern States, together with delegates from other parts of the country, all interested in the promotion of better rural conditions and a more advanced type of agriculture in the South, met with officials of the Department of the Interior and the Bureau of Reclamation in a Southern Reclamation Conference, held in the auditorium of the Interior Department, December 14 and 15, 1927.

MORNING SESSION, DECEMBER 14

Following the registration of the delegates, the conference was called to order by Dr. Elwood Mead, Commissioner of the Bureau of Reclamation, presiding. Hon. Hubert Work, Secretary of the Interior, in his usual felicitous vein, welcomed the delegates to the conference. The Secretary stated that he was intensely interested in this scheme of home making, and that unquestionably an opportunity exists in the South for planned group settlement by extending the principles of western irrigation to that region. He called attention to the fact that a well thought

out plan of agriculture should go hand in hand with the engineering works. He referred to the Interior Department as the "home-making" department of the Government, and stressed the thought that this movement is not for the purpose of creating more agricultural land, but of organizing communities with an attractive rural home life.

The response to the Secretary's address of welcome was made by Dr. W. W. Long, director of extension service, of South Carolina. Doctor Long stated that Secretary Work was the first Secretary of the Interior to call attention to the fact that reclamation is national in scope. He referred to recent criticism of the movement, growing out of ignorance and misunderstanding of its purpose, but stated that if the South caught this vision of a demonstration of organized community life the critics of the movement would be shamed and the Secretary would be hailed as one of the South's great benefactors. Doctor Long stated that we need a positive, direct, and intelligent leadership that deals with specific and definite details and not in glittering generalities.

George C. Kreutzer, director of reclamation economics, then spoke on the progress of the southern investigations, recalling the recommendations of the three special advisers on southern reclamation, appointed a year ago by the Secretary, and outlining the assistance the bureau had received from cooperating sources in its recent study of the seven tracts of land selected for this investigation by the States of North and South Carolina, Georgia, Florida, Alabama, Mississippi, and Tennessee. Mr. Kreutzer then took each project in order and gave a brief summary of the data gathered and the conclusions reached, with particular reference to costs of development and the agricultural programs which had been worked out for each project.

Doctor Mead then addressed the conference on the subject of a plan for the creation of organized rural communities in the South, stating that the conference had been called to enable the Bureau of Reclamation to explain to its associates and cooperators in the South what has been done and what has been learned. He referred to present conditions, con-



Some of the delegates attending the Southern Reclamation Conference

trasting them with conditions in Australia, Denmark, Germany, and Holland, where planned community organization has been such a potent factor in rehabilitating the rural life of the people.

AFTERNOON SESSION, DECEMBER 14

David R. Coker, of Hartsville, S. C., presided and introduced Hon. Lawrence D. Tyson, United States Senator from Tennessee, who spoke on opportunities of Tennessee for organized community settlement. Senator Tyson said he believed that the present movement is going to be the finest thing to help solve the farm problem that has ever been presented to the American people. He pointed out the many opportunities in Tennessee for this proposed work, with particular reference to the Mayland tract, stating that there would be no question about getting settlers; that under the proposed plan Tennessee farmers would take every farm made available.

The Senator stated that the question of increasing our agricultural land and producing a surplus did not enter into the present picture, as it would take many years to try out the experiment and we must in the meantime be preparing to meet the great increase in our population. The Senator asserted that he was interested in the movement not from a purely local standpoint, but from that of the development of the Nation as a whole, stressing the fact that this proposed development must be made so attractive to the rural boys and girls that they will not leave the farm. He gave statistics showing the amount of farm land that had been abandoned throughout the South during the past six years and asserted that to stop this we must show these people that it is to their interest to stay on the farm; that this is the opportunity to do this; and that any amount of money appropriated is not too much to spend to bring this about. Tennessee, he concluded, will be behind this movement, heart and soul.

Dr. E. C. Branson, of the University of North Carolina, then spoke of the economic and social significance of a homeowning people, contrasting this with the landless, homeless, tenant-ridden situation in many parts of the South. The ability to live together with others comfortably, prosperously, and happily, he said, is a fine art. This movement, he asserted, offers not a charity, but an opportunity, adding that we must solve the problem by subsoiling the public mind in preparation for the work.

Mr. Coker then referred to the fine work the railroads in the South, through their development departments, have

been doing for many years in promoting agricultural and industrial development, and introduced Clement S. Ucker, director of development of the Seaboard Air Line Railroad.

Mr. Ucker stated that civilization depends on our bringing about the establishment of more self-sustaining, prosperous, and enduring farm homes, and that the development of such organized communities is a matter that touches and strengthens the Nation itself.

Hugh MacRae, of Wilmington, N. C., said that there is a vast amount of valuable information already in the South which can be drawn on, but that this can be done to advantage only through demonstrations such as these projects would afford. He asserted that one planned rural community, if placed in each Southern State, would be an example of the utmost importance to rural life in those States. He believed that the necessary funds should be appropriated, and that the South should no longer be expected to make an unaided struggle against present agricultural conditions in that locality.

Colored lantern slides were then shown by Doctor Mead, illustrating planned community development in Australia, Scotland, and Germany, followed by a few scenes on the irrigation projects of the West, showing the primitive homes of the early settlers and the present homes of well-to-do water users. Then followed two reels of motion pictures showing scenes on the tracts in the South which have been under investigation by the bureau, and planned community development on Mr. MacRae's colonies near Wilmington.

MORNING SESSION, DECEMBER 15

The morning session of December 15 opened at 9.30 with Mr. MacRae presiding. The first address was by Hon. E. C. Finney, First Assistant Secretary of the Interior. Mr. Finney stated that in his opinion each section of the country is entitled to the opportunity to develop its natural resources, that the proposed plan is a constructive one, and that the time is opportune to put the plan into operation, asserting that the slogan "Back to the soil" is one that can not be repeated too often.

Mr. MacRae then introduced Hon. W. M. Whittington, Member of Congress from Mississippi, calling attention to the fact that Mr. Whittington had been a member of the House Committee on Irrigation and Reclamation and is especially fitted to assist in bringing about the proposed development.

Mr. Whittington made the national aspect of reclamation the key note of his

remarks. There is just as good reason, he said, as a matter of public welfare to extend reclamation to other sections of the country as there was to initiate it in the West. There is just as good reason for the drainage of swamp lands or the reclamation of cut over lands as there is for the irrigation of arid lands. Reclamation, he said, must be extended to the whole country. He asserted that the so-called overproduction did not bother him so far as it relates to reclamation, stating that you might as well argue that a tariff conduces to overproduction of manufactured articles as that reclamation conduces to overproduction of farm products. In the last analysis, he said, the problem of all reclamation is a matter of settlement, with all that this connotes of a social and organized community rural life. Agriculture is the basic industry of the country. The population is steadily increasing, and we must provide for this increase.

Hon. William J. Harris, United States Senator from Georgia, and a member of the Senate Committee on Appropriations, was then introduced. Senator Harris spoke briefly, the trend of his thought being that within a very short time the necessary appropriations for this great work would be forthcoming.

Doctor Branson then read the resolutions of the committee on legislation, which indorsed the policy of southern reclamation and recommended that Congress be asked to authorize the work and appropriate funds to put it into effect in the Southern States, the money to be expended under the direction of the Bureau of Reclamation.

J. M. Patterson, chairman of the Georgia Reclamation Committee, stated that we must educate the public and the legislatures to the new conception of reclamation; that this proposed work does not mean the bringing into production of large areas of agricultural land, but of making contented, prosperous, organized rural communities.

Dr. Burdette G. Lewis, chairman of the Florida Reclamation Committee, discussed the resolution, which was then adopted unanimously by the conference.

Hon. Walter F. Lineberger, former Member of Congress, and consulting engineer, stated that he believed that it is fundamentally sound to extend the work of the Bureau of Reclamation to include the South; that he is heartily in favor of the great program outlined, adding that this is more than a proposition for reclaiming land; it is a great social and economic movement of the most vital benefit to our whole country.

The concluding address of the morning session was given by L. J. Folse, general

manager of the Mississippi State Board of Development, who gave an inspiring talk on the need from a national standpoint of improving present agricultural conditions in the South. Southern rural life, he said faces a greater challenge than ever before. We can meet this challenge through the proposed program of planned development. On the question of where the settlers were to come from, he stated that there need be no worry on that score; that he had never seen a farm with a comfortable and habitable house with a "for rent" sign on it. Establish a group settlement with habitable houses and settlers will flock there.

AFTERNOON SESSION, DECEMBER 15

The afternoon session was presided over by Rutledge Smith, of Tennessee. It was agreed that effort should be made to have the proceedings of the conference printed as a public document.

Following a few inspiring remarks by Mr. Smith, the conference adjourned.

Those attending the conference were as follows:

Amory, Copley, 1811 Q Street NW., Washington, D. C.
Amory, Mrs. Copley, 1811 Q Street NW., Washington, D. C.
Baker, Charles H., assistant to general attorney, Chicago, Burlington & Quincy R. R. and Northern Pacific Ry., 505 Transportation Building, Washington, D. C.
Bankhead, Hon. W. B., Member of Congress, Tenth Alabama district, House Office Building, Washington, D. C.
Ball, Bert, National Crop Improvement Committee, 105 South La Salle Street, Chicago, Ill.
Barrett, T. E., commercial agent, Norfolk & Western Ry., Baltimore, Md.
Bellah, L. P., general industrial agent, Nashville, Chattanooga & St. Louis Ry., Nashville, Tenn.

Minidoka Project Beets Make Profit for Growers

Minidoka project farmers have completed their beet harvests. It is understood that Cassia and Minidoka Counties supplied more than 46,000 tons of sugar beets to the Burley factory. The north side of the project averaged 14½ tons per acre and the south side 13¼ tons. The heaviest yield was stated to be from the 10-acre field of E. Bowman, near Rupert, whose crop averaged almost 27½ tons. Fifty-five acres in a tract belonging to the Amalgamated Sugar Co. yielded a little more than 20 tons per acre. The quality of the beets grown was good and the sugar content satisfactory. This year's contract price to growers was \$7.50 a ton, with a possible bonus dependent on the price of sugar. Last season's bonus amounted to \$1.24 a ton. Good prices have also been paid for beet tops left in the fields, this by-product, which is fed to sheep and lambs, bringing as high as 50 cents to the ton of beets delivered.

Benjamin, Jesse, biochemical engineer, Technical Interests, Clermont, Fla., 1411 Montague Street, Washington, D. C.
Beveridge, Bruce, Selma, Ala.
Bissell, Charles A., chief, engineering division, Bureau of Reclamation, Washington, D. C.
Blanchard, C. J., representing Hardee County, Waukeela, Fla.
Blythe, S. O., the Country Gentleman, 889 National Press Building, Washington, D. C.
Branson, Dr. E. C., University of North Carolina, Chapel Hill, N. C.
Brookings, W. DuB., manager, natural resources department, United States Chamber of Commerce, Washington, D. C.
Brown, Dr. Hugh A., assistant director of reclamation economics, Bureau of Reclamation, Department of the Interior, Washington, D. C.
Brown, P. J., banker, Albany, Ga.
Burlew, E. K., administrative assistant to the Secretary, Department of the Interior, Washington, D. C.
Byrns, Hon. Joseph W., Member of Congress, sixth Tennessee district, Washington, D. C.
Cardwell, G. A., agricultural and industrial agent, Atlantic Coast Line R. R. Co., Wilmington, N. C.
Carroll, Col. J. H., assistant to president, Northern Pacific Ry., and general attorney, Chicago, Burlington & Quincy R. R. Co., 505 Transportation Building, Washington, D. C.
Church, Capt. H. F., assistant commissioner port development, representing South Carolina Reclamation Commission, Charleston, S. C.
Coker, David R., plant breeder, and director Federal Reserve Bank of Richmond, Hartsville, S. C.
Davis, J. Irwin, county agent, Albany, Ga.
Dean, Wm. Harper, manager, agricultural department, United States Chamber of Commerce, Washington, D. C.
Engle, Charles A., supervising engineer, Bureau of Indian Affairs, Washington, D. C.
Fess, Morris, chairman, Coastal South Carolina Agricultural Development and Industrial Association, Dillon, S. C.
Fletcher, Hon. Duncan U., United States Senator from Florida, Senate Office Building, Washington, D. C.
Folse, L. J., general manager, Mississippi State Board of Development, Jackson, Miss.
Gress, Morgan V., member Florida Reclamation Committee, Jacksonville, Fla.
Grimsley, Geo. A., president, Security Life & Trust Co., Winston-Salem, N. C.
Hawkins, M. S., president, John L. Roper Lumber Co., Norfolk, Va.
Hearn, W. E., United States Department of Agriculture, Washington, D. C.
Hull, Hon. Cordell, United States Representative from Tennessee, Washington, D. C.
Jackson, J. F., general agricultural agent, Central of Georgia Ry., Savannah, Ga.
Jackson, T. S., secretary-manager, chamber of commerce, Hattiesburg, Miss.
Jeffords, S. L., special investigator of land reclamation and settlement, Spartanburg, S. C.
Jenkins, Joe D., general manager, Florida State Chamber of Commerce, Jacksonville, Fla.
Jennings, E. H., postmaster and representative South Carolina Agricultural Society, Charleston, S. C.
Jones, P. G., director of development, Mississippi Central Ry., Hattiesburg, Miss.
Keffler, Charles A., director agricultural extension, University of Tennessee, Knoxville, Tenn.
Kreutzer, George C., director of reclamation economics, Bureau of Reclamation, Department of the Interior, Washington, D. C.
Laird, B. L., farm land developer, Sebring, Fla.
Leach, Charles F., farmer, Monticello, Fla.
Lewis, Dr. Burdette G., vice president J. C. Penney-Gwinn Corporation, and chairman Florida Committee on Reclamation, Penney Farms, Fla.
Lineberger, Hon. Walter F., consulting civil engineer, former Member of Congress, Fort Lauderdale and Hollywood, Fla.
Long, Dr. W. W., director of extension, University of South Carolina, Clemson College, S. C.
McBride, J. W., general agricultural agent, Seaboard Air Line Ry. Co., Savannah, Ga.

McCready, J. Harrison, president, board of supervisors, plantation drainage, irrigation and improvement district, Broward Co., Fla., 800-803 Ingraham Building, Miami, Fla.
MacRae, Hugh, chairman Southern States Associated Committees on Reclamation, Wilmington, N. C.
Manning, Warren H., landscape designer, 210 Brattle Building, Cambridge, Mass.
Marshall, Wm. H., farmer, Fort Lauderdale, Fla.
Mason, J. Rupert, San Francisco, Calif.
Mays, E. D., development department, Seaboard Air Line Ry., 203 Liberty Bank Building, Savannah, Ga.
Mead, Dr. Elwood, commissioner, Bureau of Reclamation, Department of the Interior, Washington, D. C.
Montague, R. L., Charleston, S. C.
Newell, F. H., consulting engineer, Washington, D. C.
Patterson, E. O., solicitor, Department of the Interior, Washington, D. C.
Patterson, J. M., pecan grower, chairman Georgia committee, Putney, Ga.
Peterson, George M., representative for Fred Delano, 4242 Thirtieth Street NW., Washington, D. C.
Preston, Porter J., superintendent, Yuma reclamation project, Yuma, Ariz.
Price, W. E., general immigration agent, Southern Railway, Washington, D. C.
Rice, Thos. D., Bureau of Chemistry and Soils, Department of Agriculture, Washington, D. C.
Robertson, A. D., Seaboard Air Line Ry., Hamlet, N. C.
Rodman, W. B., general counsel, Norfolk-Southern Railroad Co., Norfolk, Va.
Schnurr, Miss Mae A., secretary to the Commissioner, Bureau of Reclamation, Department of the Interior, Washington, D. C.
Smith, Rutledge, Tennessee Central Railway, Nashville, Tenn.
Stevens, Ben M., merchant, Richton, Miss.
Talmadge, Eugene, commissioner of agriculture, Atlanta, Ga.
Tyson, Hon. Lawrence D., United States Senator from Tennessee, Washington, D. C.
Ueker, Clement S., director of development, Seaboard Air Line, Savannah, Ga.
Walker, Dr. W. H., Williams, Calif.
Webb, O. B., assistant to president, Texas Pacific Ry., New Orleans, La.
Weininger, Edgar, photographer, Washington, D. C.
Whaley, J. K., lawyer, McRae, Ga.
White, G. W., general passenger agent, Gulf, Mobile & Northern R. R., Mobile, Ala.
Whitford, A. C., consulting engineer, Watson Hotel, Miami, Fla.
Work, Dr. Hubert, Secretary of the Interior, Washington, D. C.

Irrigation in India From Lloyd Barrage

A recent issue of the Christian Science Monitor gives some interesting figures concerning the Lloyd Barrage now under construction in India.

The object of the barrage is to give an assured supply to and to extend the irrigation now effected by the numerous inundation canals in Sind, which draw their water from the Indus. This will be achieved by the construction of a barrage nearly a mile long between abutments, across the Indus, which will be by far the biggest work of its kind yet completed.

From this barrage seven canals will take off, irrigating more than 5,000,000 acres. The cost of the scheme will be about \$60,000,000. Altogether the barrage will protect an area considerably larger than Wales.

Reconstruction of Zillah Wasteway, Yakima Project, Washington

By D. L. Carmody, Maintenance Engineer, Sunnyside Division

THERE is an old saying that "Rome was not built in a day," and the same can truthfully be said of irrigation projects. Like the fast-growing towns and cities, there is always the need of expanding the existing facilities, or of new construction to keep up with the demand for public improvements. In the towns and cities the demands are for sewers, domestic water supply, or paving. On the projects the improvements are largely in the nature of works and structures for the conservation of water or for better control and regulation.

On the Sunnyside division of the Yakima project every effort is being made to keep up with the general need of improvements and each year some feature is selected to receive attention. During the year 1925-26, as a part of the regular maintenance program, the reconstruction of 727 feet of wooden flume at the lower end of the main canal wasteway was undertaken and carried to a successful completion.

The new structure is of the same length as the one it replaced and is a U-shaped, concrete flume of the thin-wall type, heavily reinforced. Except for the last 30 feet at the outlet end and a section under the Northern Pacific Railway, the walls and the floor are 6 inches in thickness. The inside dimensions are the same throughout the length of the flume, the bottom width being 7 feet and the height of the side walls 5 feet 6 inches.

The side walls are reinforced with $\frac{1}{2}$ -inch round bars spaced 7 inches center to center on both faces. The bars on the inside faces are continuous across the floor, with loops at the junction of the

walls and floor. The outside bars extend 3 feet into the floor on each side. Every alternate bar in each face is the full height of the side walls; the others extend but half way.

The longitudinal steel consists of 33 lines of $\frac{1}{2}$ -inch round rods lapped 40 diameters at junction points.

Uncompahgre Project has Many Prize Winners

The fruit exhibit from Delta County, Colo., in which the Uncompahgre project is located, captured 5 sweepstakes, 30 first prizes, numerous second prizes, \$200 in special prizes, first prize on every entry made except Jonathans, and sweepstakes on potatoes at the Horticultural Exposition and National Fruit Show at Kansas City.

The Montrose 4-H Club took first prize in the annual canning contest conducted by the Hazel Atlas Glass Co., of Philadelphia, in the western section, including the States of Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming. The club was made up of 13 girls who worked during the summer in preparing the exhibits. The articles canned were chicken, carrots, tomato soup, corn relish, picallili, apricots, sweet cherries, pear preserves, beets, corn, pears, cabbage, watermelon preserves, mince meat, sausage, pickles, red raspberries, fruit salad, tomato pickles, sour cherries, pork chops, and apples.

The last 30 feet of the flume has side walls and floor 8 inches in thickness, and 15 feet of the flume is cantilevered over the pool into which water is discharged. The cantilever section is supported by a reinforced concrete pier, with a base 4 feet 6 inches by 12 feet, carried down to an elevation 2 feet below the deepest part of the pool.

For about 100 feet of its length the flume passes through a horseshoe-shaped culvert under the tracks of the Northern Pacific Railway and in this section the side walls and floor of the culvert were filled out to make its cross-section conform to the new work.

The pier and lower end of the flume are protected by a puddled earth embankment, extending to high ground on both sides of the flume and the embankment is faced with a blanket of large gravel and rock of a one-man size. The top of the embankment is 6 inches below the top of the flume.

For its entire length the flume is located in a deep cut which necessitated unusual precaution being taken to insure proper drainage facilities around and under the flume. To accomplish this, a foundation of gravel 10 feet wide and with a minimum depth of 18 inches was provided and under the center of this was laid a line of 6-inch vitrified clay tile.

The flume was put into service at the beginning of the 1926 irrigation season and successfully carried more than the quantity of water for which it was designed.

The work was done by the regular maintenance forces of the Sunnyside division and the total field costs were \$13,989.68.



UPPER END

ZILLAH WASTEWAY

LOWER END



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor, New Reclamation Era



Happy and Prosperous New Year

LET this be an individual message to each and every one of our readers.

We all have something to be thankful for that occurred during the past year, and we should start the new year full of a realization that new opportunities will be afforded. It is up to us to grasp these and make the most of them.

Traveling Schools

In certain parts of the United States and in Europe traveling schools are resorted to to bring to the people in rural districts the means of schooling that would otherwise be denied them.

In the United States they reach a class of traveling people who, due to the nature of their occupation and their lack of means would otherwise be deprived of educating their children, for example, harvesters and their families who follow the crops.

In Europe special agricultural courses are given by this method. They are reported popular as are also the domestic-science courses given by the same method.

Education in approved methods in farming, started on a small scale among Negro farmers of the South, has been expanded by necessity through the Government service.

SCHOOLS ON WHEELS IN UNITED STATES

We are proud of what has been done on our projects to improve educational conditions and the methods in agriculture. We thrive on stories that come to us of the erection of new schools, the establishment of new courses, the opening of a new branch library, or extension work along this line—all spell progress.

Has it ever occurred to you that other sections of our own country do not have these advantages?

The extension of the bureau's investigations to southeastern United States reveals conditions such as shown in the accompanying illustration. Antiquated methods in agriculture retard progress. It was to improve conditions in his race that inspired Booker T. Washington to give to the negro farmers of the South agricultural schools on wheels; in other words motorized classrooms. Through this medium they are enjoying a release from agricultural ignorance by which the race long was handicapped.



Thirteen children to this southern family

By carrying education to the farmer at his home the agricultural school on wheels reaches a class that could not be reached by the educational institution of the ordinary type. These farmers, the ones that need this training the most, lack the moral courage and funds to attend the more formal institutions to which they would have to travel back and forth and enter into competition of class work.

Besides teaching the men improved agricultural methods the movable school coaches wives and daughters in practices which enable them to improve living conditions and home environment.

SCHOOLS ON WHEELS IN CANADA

The Department of Education in the Province of Ontario has what is known as railway school cars to serve the localities too thinly settled to justify buildings. There are, also, many groups developing New Ontario that do not represent permanent communities but which change their places of abode following pioneer development of railroads, etc.

These cars are equipped with furniture and fitted with all things needful for the school. In addition, the minister of education has provided two public libraries fitted with books and equipment which occupy space in the classroom cars. The teachers serve as librarians. The cars,

one on the C. P. R. and one on the C. N. R., will stop for classes at seven selected places in an approximate distance of 120 miles. At each place, the children will enter the car for daily instruction and then receive assigned home work to keep them employed till the cars make their next visit. The cars pass over their respective routes about once in five weeks.

The public library features are of special interest. The bookcases are finished to match the hardwood trimming in the cars. The books are new and in fine editions. Each library is made up of reference books, works on subjects of general interest, and standard fiction with Canadian authors predominating. Adult books form less than a third of the collection. There is an especially fine collection of books for older boys and girls, consisting of the best type of stories and books which represent subjects in which young people have a natural interest. The books are in easy English and the type, illustrations, and style adapted for the purpose of making a favorable impression as an introduction to the world of books.

GERMANY'S TRAVELING SCHOOLS

When about 30 years ago Schepp, the agricultural adviser, began to establish household management courses at Siegen



Methods still in use in the South

a portable hut, the property of the Siegen Boys' Red Cross Society, was used for the classes and for storing the equipment, but this precedent has not been followed. It is usual, instead to have a traveling equipment, there being, as a rule, no difficulty in finding suitable premises in the different villages.

In a traveling school of this kind, at which the girls attend throughout the week, it is possible to employ special teachers. Such teachers of domestic economy have begun work in the country districts in these traveling household management schools (*Wanderhaushaltungsschulen*).

At present it is not practicable to have a permanent teacher, except on this plan. This is a serious inconvenience, since it is very difficult with the constant moving about to pay attention to the general training. It is consequently doubtful whether the traveling school will come into very general use. On the one hand, there is a tendency to replace it by the continuation school, which would mean that the fuller equipment and the special teachers were dispensed with; on the other hand, an attempt is being made to reduce the number of districts served by the traveling school of household management. If attendance at the traveling school were compulsory, as it is at the continuation school, or if attendance at the traveling school involved exemption from attendance at the other, there would be at once a considerable rise in the number of pupils attending the traveling schools, so that in a single district there

would be room for three or four such schools. If these schools were conveniently placed within a limited area, it would be possible to give up the migratory system, while the pupils of the different communes could attend in a fixed rotation at a school in permanent premises. Each commune would be obliged to send the girls for three months, every three years. Girls coming from the communes nearest to the school would go home to sleep, the others would have to be lodged at the school. The cost would not be very high; at present the pupils nearly always take their meals at the schools, after preparing the food themselves. The dormitories would be of a quite simple kind and kept in order by the girls themselves. Such a scheme might well be completed by the establishment, in the separate communes, of the school district, of small continuation schools under the direction of the managing head of the household management school, so as to prepare the younger girls for the school and to keep up the general education of the elder girls who have already been in attendance, and thus make the results of the special instruction more lasting. It is not possible to prophesy at this stage as to the future development of these institutions, especially as a certain rivalry is observable between the household management traveling school and the courses for girls at the schools of agriculture.

The curriculum of the traveling school must naturally be simple. The following passage may be quoted from a lecture

given by Schepp at the second general meeting of the German Society for Family Welfare and Prosperity, on February 17, 1898:

"The morning is devoted to work in the kitchen, the afternoon to the theory of cookery, including invalid diet, to ironing, mending, and other kinds of women's work. The pupils receive instruction from experts on our experimental plots, and at intervals the director of the winter school of the neighboring district instructs them in the feeding and management of milch cows and calves. All the teaching follows the lines of the "Guide to Domestic Well-being," a small textbook which contains all that a housewife ought to know and which can not be too highly recommended. The manual is distributed to the pupils at the reduced price of 30 pfennig. At the end of each course 20 or 24 pupils take a practical examination and receive a certificate of competence. At this examination the mothers, the communal authorities, the ministers and the presidents of the women's associations are present, and become acquainted with the results of the teaching."

It is seen that as early as the end of last century the original idea of instituting traveling cookery courses was given up and instead instruction was given in household management, with a decided agricultural bias.

Gopher Invasion on Irrigation Project

From October 1, 1926, to August 19, 1927, the Tieton Water Users' Association, Yakima project, Washington, paid bounties on 9,633 gophers, according to Secretary Floyd Foster in a recent issue of the Yakima Daily Republic. Rewards of 5 cents each are paid for each gopher killed, the total amount during the period being \$481.65. It was expected that fully 10,000 gophers would be paid for by October 1 of last year.

The owner of one orchard of 120 acres has collected pay on 1,800 gophers. In addition to those whose pelts are saved and on which rewards are collected, many are poisoned. There is no way of estimating how many are killed by this method. Traps, poison, and every method which can be thought of to rid the orchards of the pests are being used.

THE new beef feeding yards at Belle Fourche are using 135 tons of beet pulp a day, feeding 1,500 head of steers.

Summary of Report of Advisers to the Secretary of the Interior on Economic Conditions on Federal Reclamation Projects Petitioning for Extension of Time for Repayment of Construction Charges

EARLY in the year 1927 Secretary Work addressed a letter to the chairmen of the Senate and House Committees on Irrigation and Reclamation, respectively, calling attention to the requests for deferment of payment of charges by a number of the Federal irrigation projects, setting forth the opinion of the department that no extensions should be granted at that time in view of the concessions already granted by Congress under the adjustment act, and proposing that a comparative study be made of the charges on these and other projects and of the ability of the water users to meet their obligations under existing contracts.

A conference was held with the members of these committees and it was agreed that instead of attempting to deal with these requests for deferment as an administrative matter of the department, arrangements would be made for a careful economic study of existing conditions on these projects. This study was accordingly placed in the hands of three advisers who had been previously designated to make a survey of economic and engineering conditions on the Indian irrigation projects. These advisers were Porter J. Preston, superintendent of the Yuma irrigation project, Bureau of Reclamation; Charles A. Engle, supervising engineer, Bureau of Indian Affairs; and Ray P. Teele, associate agricultural economist, Bureau of Agricultural Economics, Department of Agriculture. Mr. Teele died after the investigations had been practically completed, and J. L. Lytel, superintendent of the Yakima irrigation project, Bureau of Reclamation, was later designated to act in place of Mr. Preston in the investigation of the Yuma project. These advisers have now submitted their report on the Federal reclamation projects, with the following general observations and conclusions:

During the field studies certain facts were observed that are general to all projects.

On nearly every project a number of farmers apparently fail to appreciate the responsibility involved in their contracts with the Government. Irrigation districts neglect to extend their assessment rolls in order to make the necessary levies for meeting their payments unless prompted by the bureau. Many water users make no provision for taking care of their payments until the Government closes off their water. The feeling that often prevails is that the Government will not assume the responsibility of dis-

continuing the delivery of water to any considerable number of farmers, and that relief of some kind will be given. Relief and extensions heretofore granted have strengthened this feeling.

If there is to be a higher regard in the future for the responsibility of water users respecting their contracts with the Government, modification of existing contracts should be made only when there is a very sound economic reason, and then only after very careful consideration.

A general feeling exists among many people on the various projects that when money is paid the Government and is deposited in the Federal reserve banks, the community loses by that amount. For this reason bankers and business men often advise against the payment of irrigation charges if it is possible to avoid such payment. The fact is overlooked that the Government at some previous time expended this amount in that community. Agitation for relief and for extension of time to make construction payments often has its source in the banker, mortgage holder, and business man, all of whom are more anxious to increase the farmer's immediate means to purchase, or to care for local obligations, than they are to see him discharge his obligation to the Government and preserve the solvency of reclamation.

Some of the projects suffered very severely from land inflation during and after the war. Deflation has been resisted by all classes on the projects. Lands fail to move at prices asked and stagnation in this line results. The Government is urged to relieve the situation by reducing water payments and thus enhance land values. Agitation in the past for relief measures pending or passed by State or National Governments has given a false support to orderly readjustment on a sound economic basis. Some projects are now getting land values partly deflated; others are just beginning the process. Relief is seldom of sufficient amount to help many farmers on such projects, and it can never remedy their economic ills.

All this has had the effect of lowering the morale of the water users. In order to improve this morale these elements must be eliminated.

The Bureau of Reclamation is regarded as the leader in irrigation development in this country. On the success of its administration, on its methods of procedure and policies as well as results accomplished, will depend the progress and prosperity of a large part of the arid region. It is, therefore, very important that the full intent and purpose of the reclamation laws be carried out with rigid adherence to modern business methods and in order to do this the landowners must be required to carry out the terms and conditions of existing public notices and contracts promptly and honestly.

In their recommendations for specific projects it should be borne in mind that the economic advisers were dealing

not alone with conditions on a certain project but with these conditions as they related to all the other projects with a view to effecting equality of treatment. A summary of their recommendations for these specific projects follows:

The Rio Grande project, New Mexico-Texas, requested an extension of time from 20 to 40 years to complete payments, because of the low price received for cotton in 1926 and because such extensions of time had been granted to other projects. The advisers pointed out that all construction cost payments had been made promptly until 1926; that the average per acre crop return from cotton from 1922 to 1926 was \$98.42, the average for 1926 being \$56.90, and that the price of cotton has since advanced from 14 to 21 cents a pound; that the project with a construction cost of \$90 has an average annual crop value for all crops of \$76.25; and that the water users are in a much better position to meet their payments than more northerly projects which are making regular payments although with a much lower crop value. It was accordingly recommended that no extension be granted.

The Tieton division of the Yakima project, Washington, requested Government expenditures to secure an additional water supply, and extension of time for repayment of cost, stating that there was insufficient water for the project lands. The advisers pointed out that the logical solution appears to be to reduce the project area to conform to the water supply available by eliminating unproductive lands and transferring the water to productive lands needing the additional supply, calling attention to the fact that the Tieton division is one of the most prosperous orchard districts in the Northwest and that those owning developed farms have no difficulty in meeting their water payments promptly. The request for extension of time comes chiefly from owners of undeveloped land, young orchards and those owning 3,032 acres of poor land which the bureau has offered to eliminate from the project. To grant an extension would amount to using the reclamation fund for loans for development and encourage the use of water on poor land. It was accordingly recommended that the request be denied.

The Granger irrigation district, Yakima project, Washington, requested an extension of time from 20 to 40 years, on the ground that the construction cost of approximately \$156 per acre is more than they can pay within the 20-year period, and that considerable additional construction work other than that covered by the Government contract was necessary to complete the system. The advisers state that there is no foundation for the latter contention; that the district is particularly adapted to, and is being largely devoted to the growing of fancy fruit similar to that produced at Snipes Mountain, an adjoining district, where annual per acre returns of \$300, \$500, and even as high as \$1,000

to \$3,000 are reported. The district was eager to sign the contract five years ago, and there has been no change in economic conditions in the meantime. The advisers accordingly recommended that the request be denied.

The Prosser irrigation district, Yakima project, Washington, also requested an extension of time on the ground that the annual irrigation charges, ranging from \$7.50 to \$13 per acre, are more than can be paid as the land is not suitable for fruit, but is devoted to general farming with an average annual crop return of \$41 per acre. The advisers found that conditions justified an extension of time and recommended that the time of payment be extended so as to make the total repayment period 30 years.

The Okanogan project, Washington, requested relief because of an inadequate water supply. The advisers found that although the project area has been reduced by the exclusion of 2,383 acres of sandy lands, the water supply is still inadequate, more than 700 acres of orchard having been lost from 1918 to 1926 through water shortage. They accordingly recommended that the area of the project be reduced to the area for which there is an

adequate water supply, or approximately 3,800 acres; and that the irrigation district take over the operation and maintenance, the charges to be paid in 58 semiannual installments.

The Chinook division, Milk River project, Montana, requested an extension of time from 20 to 40 years, because of heavy bonded indebtedness and consequent large interest and retirement payments; large operation and maintenance costs; and large areas of uncultivated land. The advisers found that the construction cost of \$15 per acre is payable under the existing contract in 20 years, or at the average rate of only 75 cents per acre annually. On the ground that the yearly payment is so small that there is no sound argument for its reduction, the advisers recommended that the request be denied.

The Orchard Mesa irrigation district, Grand Valley project, Colorado, requested an extension of time beyond 20 years for the reason that the district was originally promoted with the idea that the entire area was suitable for fruit growing, whereas only about one-seventh is actually adapted for that purpose, the remaining lands being adapted only to general farming. The advisers believed

that the interest of both the district and the Government would be best served by extending the period of repayment from 20 to 30 years, and so recommended.

The Valley division, Yuma project, Arizona, requested an extension of time from 20 to 40 years to pay construction charges, giving as reasons the low price of cotton in 1926; that such action would leave more money for the payment of other debts and would help to sell the lands; and that other projects had been given 40 years in which to complete their payments. The advisers pointed out that the division has a long growing season, good soil and climate, and good farmers with an ample water supply; that a water right is being furnished for \$85 which cost the Government \$113.40, and that the \$85 charge will be reduced by revenues and credits amounting to \$22.41, thus making the actual cost of water about \$62.50 per acre, a very reasonable charge. The average crop return for the period 1922 to 1926 was \$70.38 an acre, and since application for extension was made, the price of cotton has advanced from 14 cents to 21 cents a pound. The advisers accordingly recommended that the request be denied.

Huntington Downer, of Deaver, Wyo., Makes His Chicken Ranch Pay

By L. H. Mitchell, Superintendent, Shoshone Project

ABOUT 4 miles south of Deaver, Wyo., in the Deaver irrigation district of the Shoshone project, Huntington Downer filed on a homestead on March 17, 1922. Since that time Mr. Downer has gradually developed his holding and in the spring of 1926 he started the construction of a large modern poultry farm.

His chicken house, which is 28 by 208 feet, is constructed on a terrace on the south slope of a rimrock bench. This arrangement affords plenty of sunshine and conditions are ideal for a poultry farm. Mr. Downer has running water in each of the 16 rooms and has all the modern appliances.

Last April Mr. Downer started this enterprise with about 7,000 baby chicks. He had a ready market for his broilers last summer at the Burlington Inn at Cody, Wyo., and he now has about 2,000 White Leghorn hens that bring him wonderful returns on his investment. These hens consume daily 5 bushels of wheat with an equal weight of mash, and he keeps before them ground alfalfa and meat scraps. The cost of this feed is about \$10 per day.

It is an interesting sight to watch the process of gathering the eggs, as these hens lay daily from 96 to 100 dozen eggs. At the present time (December 8, 1927) these eggs are bringing 50 cents a dozen, or a daily gross return of \$45 to \$50.

Mr. Downer is now laying plans to install electric lights in his chicken plant so that the hens can start work earlier in the morning and thereby increase his profits. This electricity will be purchased from the United States and he will construct a transmission line about 4 miles in length, making connection from Deaver, Wyo.

Mr. Downer also has 200 full-blooded White Leghorn roosters for sale at about \$3 to \$5 each.

The occupation of poultryman in the Deaver irrigation district is a very attractive one as the poultryman does not have to worry as much or work as long hours as the average farmer.

AN ECONOMIC conference of Milk River project farmers, conducted by the extension service of Montana, was held recently at Malta. The conference was well attended and much interest was evidenced in the program outlined for the improvement of agriculture on the project. Particular attention was given to the settlement problem, and a very favorable reaction was obtained from several large landowners.



Mr. Downer's chicken house and new modern home

Economic Notes From the Irrigation Projects

Montana Irrigation Conference Considers Farm Programs and Settlement Problems

AN irrigation conference was held in Great Falls, Mont., November 17 and 18, 1927, to consider the problems confronting the irrigation projects in that section of the State with a view to bringing about a more profitable program in carrying on farming operations. The conference was conducted by M. L. Wilson and several of his assistants from the Montana Agricultural College, and was well attended by representatives of the railroads, the irrigation projects lying north and west of Great Falls, a delegation from Canada, and a number of Great Falls business men.

Two fundamental ideas were submitted, the first being that the success of the irrigated farm in northern Montana must be based upon livestock, and the second that that is no project where the water is so cheap and the land so favorably adapted to irrigation that the farmers can continue to raise wheat at a profit.

The first day was taken up largely in outlining a standard farm of 80 acres, which was to be divided among the following crops:

	Acres
Sugar beets.....	20
Alfalfa.....	30
Barley.....	15
Pasture.....	15

An assumption was made of probable crop yields and then an estimate was made of the number of livestock that this farm could carry. Three classes were considered: First, the dairy farm; second, sheep and hogs; and third, the straight feeder program. Income and expenditures were figured on these assumptions. The net returns ranged from \$2,500 to \$3,000, with which the farmer had to cover living expenses, taxes, construction charges, interest on investments, and miscellaneous items.

On the second day considerable time was given to the 160-acre irrigated farm, on which no sugar beets were produced. There was not sufficient time to cover all details on such a farm, but I. D. O'Donnell stated that there were several farms of this type where the gross returns were around \$5,000 per year. As in the case of the smaller farm the financial success was based upon livestock.

Reports were submitted by the chairmen of committees on poultry, livestock, dairying, crops, and land utilization and settlement. The report of the committee on land utilization and settlement, of which George O. Sanford, superintendent of the Sun River project, was chairman, follows:

"Cooperation between the landowner, the business men of the cities, the railroads, and all classes of the population who desire the development of the Treasurebelt is essential in furthering the settlement and success of these irrigated areas.

MORE HOMES NEEDED

"One of the factors which has retarded the settlement and development of the lands in this territory is the lack of houses in which to live and shelter for livestock.

"Another factor is, while in a general way there is a knowledge of the desirability of the irrigated lands in the Treasurebelt for diversified and intensive farming, it has been most difficult, in fact apparently impossible, to induce settlement by practical farmers with sufficient capital to make a down payment on lands and then have sufficient capital remaining to develop raw lands and bring them to a state of productivity.

"Your committee believes that the future development in a profitable way of the irrigable land depends on the more intensive use of the lands and greater production of feed crops and utilization of the same by livestock and on farms within reasonable haul to loading stations sugar beets should be made a prime factor in the rotation program.

"Your committee would make the following recommendations:

"That where the landowner is not utilizing his land it should be subdivided and if there are no buildings provision should be made for their construction. If he does not care to sell or can not sell without a heavy down payment, that he lease with an option to the lessee for purchase at a stipulated price and terms. That in the lease there be a provision for crop rotation, a certain specified acreage in certain specified crops, and that the landowner or his duly accredited agent have the privilege of supervising the operations of the lease for the purpose of seeing that the stipulations are lived up to.

"Where land is unimproved and the owner agrees to put on the improvements, we recommend that the maximum cost of these improvements be placed at \$1,000, this to be added to the price of the land where it is sold or an option given for its sale. In some instances it may be necessary for the landowner to construct these improvements on credit. In such cases we recommend that the purchaser be required to pay one third down of the cost of the material, one third at harvest time,

and the remaining third one year after the first harvest.

"PARTIAL-PAYMENT PLAN"

"Your committee would recommend that where land is sold, instead of a down payment, if a prospective settler has the money, he be required to put on the first year improvements costing not less than \$500. That for the following two years he be relieved from any payment on the principal, paying interest at 6 per cent and the water charges and taxes.

"It has been found to be a successful procedure on other projects in Montana to sell land on the crop-payment plan. This plan provides for the payment to the landowner of one-fifth of the beets, one-third of the grain, and, as a rule, one-half of the hay crop. This latter depends somewhat on what the landowner may furnish in addition to the land. In these crop-payment propositions the portion going to the landowner is applied to the payment of interest and principal indebtedness, while out of his share the purchaser pays the taxes and water charges.

"Your committee believes there should be experienced farm management supervision in connection with the operation of irrigated farms.

"In cases of lands lying within irrigation districts the commissioner should appoint three appraisers to place a fair value on unimproved and raw land when requested by the owner.

"That efforts be made to locate on the irrigated lands good farmers from the nonirrigated lands.

"We recommend that in order to provide dairy stock and sheep for the irrigated farms the various credit agencies available be utilized, attention being called in this connection to the facilities offered by the Agricultural Credit Corporation of Minneapolis. As it is evident there is a need for long-time credit for the development of irrigation projects in Montana, we recommend that where feasible local associations be formed to take advantage of the facilities offered by the Intermediate Credit Bank.

"Your committee recommends that special stress be given to a three-year program for farm development as planned by this conference.

"That at some convenient time in the summer of 1928, arrangements be made for an excursion from all of the irrigated projects of northern Montana for the purpose of making an inspection of the irrigated area tributary to Billings."

The Syndicate Form for Development of Citrus Orchards as Developed on the Yuma Project, Arizona

By P. J. Preston, Superintendent, Yuma project

DURING the latter part of 1922, Mr. D. W. Pontius, of Los Angeles, organized a number of the holders of 5, 10, and 20 acre tracts on the Yuma Mesa into a syndicate. The general reasons for this organization were that the average small holder of such tracts could not afford to spend the time from his other vocations to develop these tracts and await returns for five or six years; that the development required men who knew the business and could give it their entire time, that to organize such a management for a small acreage was too expensive, and in order to bring this cost within reason it would be necessary to pool the interests of a number of the holders of small tracts.

After considerable work Mr. Pontius brought together holders of 190 acres who were willing to place their acreage in a pool for such development. The holders of this acreage agreed to put their land into the hands of three trustees of an organization to be formed under the name of the Yuma Mesa Grapefruit Syndicate, and further agreed that all acreage should bear the same assessment per acre for developing purposes. The syndicate was formed for a period of 25 years and all members were bound by a written agreement to keep their holdings in the syndicate for 5 years or through the development period, but any individual might, after 5 years, withdraw his holdings from the organization by giving six months' notice and paying up all assessments due the syndicate.

The organization was perfected late in 1922 and operation began early in 1923. The holdings of the different members of the syndicate had originally been purchased in quite widely separated sections of the tract consisting of 6,000 acres, but through the Bureau of Reclamation these holdings were exchanged for others so that the tract was fairly well consolidated. Five acres additional land was purchased by the trustees for headquarters, buildings were erected, and other improvements made in order to carry on the work of development. In the spring of 1923 the entire 190 acres were leveled, the irrigation distribution system was constructed, and the area was planted about 75 per cent to grapefruit and 25 per cent to navel oranges. George M. Hill, a man having wide experience in citrus culture, was employed as superintendent. The general method of handling the business of the syndicate is as follows:

ASSESSMENTS FOR THE WORK

Assessments are levied to carry on the work for a period of six months at a time. The superintendent prepares a budget several months in advance of the beginning of the six-months period to be covered by the assessment. The budget is then submitted to the trustees for approval and when the items of the budget are approved a call is made at least 30 days before the beginning of the six-months period for the amount needed to cover the budget requirements, to be paid one-half at the beginning of the period and the other one-half three months later. Under the agreement the trustees are not obligated to spend any money on any tract that is in arrears on any assessment.

NEW SYNDICATE FORMED

In the spring of 1927 another syndicate was organized, known as the Yuma Citrus Syndicate. This organization consisted of 80 acres and ordinarily would be too small an acreage to justify the employment of a good manager, but an arrangement was worked out with the other syndicate whereby they were placed under the same management. Some slight changes in the syndicate agreement were made in the newer syndicate in order to strengthen the work of this form of organization and to safeguard the investor. The two main points were as follows: (1) The bank acting as trustee of the funds of the syndicate is required to put up a surety bond or to place other approved bonds in escrow to cover the amount on deposit by the syndicate. (2) One of the three trustees shall be the Government representative in charge of the project as long as the Government has a representative on the project. It is the practice for the management of the newer syndicate to

furnish each member of the syndicate a financial statement at the end of each month showing the amounts spent to date against the budget estimate, and also to furnish a short report giving the principal items that may interest the members of the syndicate.

Considerable acreage is also handled by private parties for different individuals at about the same cost per acre as under the syndicate plan. The advantages, however, are in favor of the syndicate plan as now worked out for the reason that it brings enough acreage together to provide a good management and a business-like method of handling the affairs of the organization to insure the individual that he is receiving full value for the money he is spending. This has filled a much-needed requirement in the development of this citrus tract. By combining the management of the several syndicates, starting a new syndicate or unit need no longer depend upon a given acreage.

The local reclamation officials have been given authority as part of their official duties (without extra compensation) to take an active hand in organizing and fostering such syndicates.

It is felt that the two syndicates now operating have given the background for working out others that will operate just as successfully as these are now working, and that no investor need fear going into this form of organization carried out as indicated above. All these developments have been carried out under the most approved methods known in citrus culture in order that they may be placed upon a good production basis. The orchards of the older syndicate are just beginning to come into bearing and should produce a good crop in 1928 that will more than pay for their upkeep.

There's a Profit If You Know How

E. J. Tilden, as reported in the Shoshone project press, farming on \$50 an acre land in the Cherry Creek district this past season, produced crops which brought \$201.84 an acre, or more than four times the price at which the land on which they were grown was purchased.

ONE unit on the Yuma Mesa reported having picked 1,041 boxes of grapefruit from 20 acres of 4-year old trees. This was considered about 60 per cent of the total crop for the 20 acres, which would give an average yield of approximately one box per tree for the entire crop.

DURING four months of 1927 more dairy cows were imported into the North Platte Valley than in the entire preceding seven years.

Educational Special Trains Visit Huntley Project, Montana

By H. M. Schilling, Superintendent

THE Huntley project, Montana, has been fortunate during the year 1927 in securing the benefit of three educational features of exceptional value for the improvement of agriculture. These consisted of special trains on the Northern Pacific Railway and the Burlington Railroad, and were known as the Sugar-Beet, Livestock, and Poultry Specials. The sugar-beet and poultry trains operated generally over Colorado, Wyoming, Montana, western South Dakota, and Nebraska, but the livestock train was particularly a Montana exhibit and the project farmers patronized these specials in a way that showed a keen desire to know the best and most profitable methods of livestock and agricultural practice.

The sugar-beet special was traveling under the auspices of the Great Western Sugar Co. and the Montana State College and visited the project on March 25, giving lectures and illustrations to about 1,200 people. W. P. Stapleton, agricultural agent of the Northern Pacific Railway, explained that the train was not intended to show beet growers things that were startlingly new or tell them things they did not know, but to show in a most effective way how much more profitable it is to do things in the right way. The beet special features were prepared under the supervision of A. C. Maxon, in charge of the experiment farm of the Great Western Sugar

Co., at Longmont, Colo. The Northern Pacific Railway Co. furnished the equipment, and the State College at Bozeman furnished men who cooperated with the sugar company and local county agents in explaining the different exhibits and illustrations. Three cars contained 224 boxes of dirt, of which 56 were under glass, and 15 tons of soil were stored in the train. It cost more than \$4,000 to prepare the exhibits.

Moving pictures, accompanied by a lecture, were very effective. The pictures showed the actual growing conditions, how the fields were prepared, proper planting, thinning, prevention of crust, disking, and harrowing as well as plowing. Charts showed the times of planting and the yields and also the yields due to time of planting and effective irrigation. One striking feature was that the pictures showed the wrong way as well as the right way of doing things.

The Livestock Special was on the project on October 25 and showed to over 1,300 people. The Northern Pacific Railway operated the train and the exhibits were in charge of the extension service of the Montana State College. No prize stock was carried, but there were two carloads of dairy and beef cattle, hogs, and sheep, such as are found in Montana, both money makers and money losers. There was one carload of feed and wool exhibits; the feeds, those provided in the country, all arranged to give

practical suggestions as to how the whole may be combined to give the best results.

A dairy cow with daughter and granddaughter bred to a pure-bred bull showed forcibly the importance of good breeding. There was a collection of four steers showing recognition taken of the feeder grades—choice, good, medium, and common—with a spread in price of \$11 to \$6 per hundred on the market. The hogs shown displayed the effects of different feeding. The sheep demonstration was for the purposes of selection for breeding and wool production. The lectures of the special agents covered the matter of livestock production and marketing in a most practical manner.

The Poultry Special was operated by the Burlington Railroad, and the motion pictures were furnished by the Agricultural College at Bozeman. The poultry demonstration featured poultry housing, selection for breeding stock, sanitation and feeding for winter egg production, and marketing. The train consisted of 10 cars, 6 of which were devoted to the poultry exhibits. Representatives of the various agencies cooperating in the campaign were stationed at all exhibits to explain them fully and to answer questions. At the end of the train valuable poultry bulletins were given to interested parties. Nearly 1,000 attended the demonstration.

Such practical and valuable exhibits and demonstrations will do much to stimulate interest and improve methods,



Haystack on the Minidoka project, 140 feet long, 22 feet wide, and 20 feet high, estimated to contain 80 to 100 tons, harvested from 13 acres of alfalfa, 2 cuttings, by E. A. Brookman, Paul, Idaho

and reflect credit on the cooperating agencies and companies responsible for them. The coming years will undoubtedly show the good results of these educational influences and the wisdom of their undertaking. The meetings tend to unite

the project people, and the work of the local committees on arrangements helped materially for success. As J. E. Patten, editor of the *Yellowstone*, remarks: "The success of the greeting to the Poultry Special of the C. B. & Q. Railway is only

another demonstration of the fact that the project is a unit when it comes to anything for the general good; that whatever we take hold of is made a success. We all work together and nothing is half done."

The Cheese Industry on the North Platte Project, Nebraska-Wyoming

By Otto C. Batch, Associate Reclamation Economist, Belle Fourche Project, South Dakota

THE cheese industry on the North Platte project had its inception in the fall of 1924 with the formation of the North Platte Valley Cooperative Cheese Co. Starting with a pledge of 500 cows, a factory, known as the Fairview factory, was constructed between the towns of Scotts Bluff and Bayard at a cost of \$9,370.73; of this amount, \$5,430.24 was invested in buildings and the balance of \$3,940.52 in equipment. Inasmuch as the location is in the rural district, provisions were made in building for living quarters for the cheesemaker and his family. The results were so satisfactory that, in the next two years, four additional factories were constructed, one each at Gering, Morrill, Bayard, and Henry, the Gering and Bayard factories being in rented quarters. This brought the total investment in buildings and equipment to \$27,699. In 1927 a centralizer plant was added at Gering, where the product from each factory is assembled as fast as it is made, graded, and prepared for shipment. The necessary financing was handled both through popular subscriptions as well as sale of stock to farmer producers. In the case of the centralizer, the town of Gering subscribed \$3,000 for the building and the Kraft Cheese Co., which takes the entire output of the five factories, installed the necessary equipment. In this connection, the cooperative is paying Kraft for the equipment at the rate of one-eighth cent per pound of cheese handled without interest while Kraft, in turn, does not pay rent until such time as the total production reaches 50,000 pounds a week.

Each factory is organized as a separate unit; representatives from the five organizations go to make up the main body or the North Platte Valley Cooperative Cheese Co. The main body acts as a selling agency and business manager for the group, setting the price each month to be paid for butter fat on the basis of what they can all pay and not on what any one factory could pay. The price paid for butter fat has ranged from 40 to 66 cents per pound, the average, taken from the date the Fairview plant opened

through August of 1927, being 51½ cents per pound. This is not as high an average as could have been paid had all five plants been financially sound. The Bayard factory was installed before that section was really ready for a factory, has had poor management, and has not been successful. The Henry factory, one of the last to be added, is still in debt but is rapidly coming in the clear. As an example of what could have been paid, the Fairview factory for August, 1927, paid the set price of 50 cents, while from its earnings it could have paid 56 cents per pound for butter fat, and that on top of a loss for the month of \$300 in grading of cheese.

When first organized, partly as a means of securing patrons, hauling of milk was done by truck on a guarantee basis. The experiment proving to be too costly, the guarantee was removed and truck hauling placed on a contract basis and the farmers urged to do their own hauling. At the present time, truck hauling costs 25 cents a hundred pounds, irrespective of distance. The Gering factory, with 41 patrons, had

all farmer haul and showed the highest net income per patron.

The experience of the North Platte Valley Cooperative Cheese Co. bears out the statements made by the University of Wisconsin, the South Dakota State College, and the Kraft Cheese Co., with respect to the cooperative cheese company. The concensus of opinion from the sources just mentioned is that to be successful, a one-vat cheese factory must have the milk from 200 to 300 cows, or a minimum of 5,000 pounds of milk daily; there must be a desire on the part of the patron to have the enterprise prosper and an inclination on the part of the farmer to deliver his own milk daily. When properly managed the cheese factory is ordinarily able to pay prices for butter fat that prevent very much competition on the part of either the cream station or the creamery. The cheese industry is best suited to the newly developing section and the sections where it is not essential that the skim milk be fed on the farm, as is the case where calves are raised as valuable enough for breeding stock.



Cheese factory on the Minidoka project

In closing, tribute must be paid to Eben D. Warner, of Scotts Bluff, and his associates for their untiring efforts in establishing this enterprise and in keeping it

progressing. Mr. Warner has devoted much of his time and money to put the North Platte Valley Cooperative across with no recompense other than the knowl-

edge that he is building the dairy industry in his community to the prominence that it should command.

Honey Production on the Belle Fourche Project, South Dakota

By F. C. Youngblut, Superintendent



Bee yard on Doctor Clark's farm, Belle Fourche project

THE season of 1928 will see three commercial beekeepers on the Belle Fourche project with a thousand or more stands of bees each, and, in addition, many farmer producers with small apiaries of 5 to 30 stands. The experience of Dr. Oscar H. Clark, of Newell, the past season illustrates the possibilities here for this growing industry.

Starting as a hobby in the production of honey for home use, Doctor Clark entered the commercial production field four years ago with 16 colonies of bees. His venture proved so successful that he substantially increased each year, starting 1927 with 600 stands. Part of the 600 stands were colonies in homemade boxes, purchased in the fall of 1926 from farmer producers, making it necessary to transfer to standard equipment. The spring remained wet and cold well up into June and each day brought counts of lost colonies through dwindling, until, up to the 1st of July, when the major honey flow first started, a loss of 50 per cent had been experienced. From

then until September 19, the end of the season, the story takes a decided change for the better. In addition to building back his apiary to 550 colonies, Doctor Clark produced 45 tons of honey, both in the comb and as extracted honey.

A modern plant is used on the Clark farm for the extraction of honey. A

Belle Fourche Honey Goes to Washington

Five hundred pounds of extracted honey have been purchased at an attractive price from Doctor Clark, of Newell, S. Dak., Belle Fourche project, by the employees of the Washington office of the Bureau of Reclamation and employees of other bureaus of the Department of the Interior. Doctor Clark's success as a beekeeper is described by Superintendent Youngblut in this issue of the New Reclamation Era.

45-frame Root Simplicity extractor removes 315 pounds of honey for each run. From the extractor the honey is carried by means of a pump to the strainers, where the wax particles are removed, and then passes by gravity to the honey tanks and finally to the containers without the usual hand method of handling. By adding to the honey-tank capacity and providing for additional packing space, Doctor Clark will have a plant large enough to care for his next year's operations, it being his intention to supplement the 550 colonies with package bees to bring the total to 1,000 producing stands by the time the main honey flow is on.

The operations for this year required the use of 2,500 pounds of foundation, being returned in part by the wax from the capping meltings. The home yard, shown in the accompanying illustration, was used this year almost entirely to build up the weak colonies, although the production of one hive, a package colony at that, was over 200 pounds of honey. His average production per colony, increases included, was 160 pounds. Had he been able to enter the main honey flow with full colonies, it is hard to estimate just what his average production would have been. Up to the present time Doctor Clark has marketed his honey throughout South Dakota and part of North Dakota and Nebraska, selling his honey direct to the retailer at prices that net him 10 cents a pound for the extracted and 20 cents a pound for the comb honey.

The high production of Doctor Clark, as well as in the case of the other producers on the Belle Fourche, can be attributed to but one source—sweet clover. The white-blossom variety abounds everywhere; along the roads, the ditches, fences, and creek and river bottoms. The yellow-blossom variety, a higher yielder of nectar than the white, is universally used over the project as a pasture crop, and when once in bloom, continues to blossom until frost.

THE number of sheep being wintered on the Shoshone project will probably exceed that of last year by about 50 per cent. The increase in feeding has been brought about by the increase in the beet acreage and the scarcity of water on the range.

Expansion of Contract Without Readvertisement

BIDS were opened on August 16, 1927, at Boise, Idaho, for the construction of a railroad for the purpose of hauling material to the dam site of the Owyhee project. The location and length of the proposed railroad were indicated on maps accompanying the printed proposals. After the opening of bids, as a result of further studies to determine the quality, quantity, and most economical means of delivery of the sand and gravel from the various available sources of supply, the Ontario-Nyssa deposits near Dunaway, Oreg., were considered decidedly superior to those of other sources nearer the dam site.

Studies made subsequent to the issuance of specifications showed that a considerable saving to the Government could be effected by building the Government

railroad direct to the Ontario-Nyssa deposits rather than by building the railroad from the dam site by the shortest feasible route to connect with the Oregon Short Line Railroad at Adrian, Oreg., as was at first contemplated when deposits located nearer the dam site were under consideration.

A change in the location of the lower 7 miles of the railroad as called for in the specifications and an increase in its length 1.8 miles were necessary, and the low bidder, the General Construction Co., indicated that the company would enter into contract on the new basis at the prices bid on condition that a suitable extension of time be granted on account of the greater amount of work involved. At the unit prices bid an increase in the contract price from \$294,592 to \$345,312,

or about 17 per cent, resulted. A total saving to the Government, however, of about \$128,000 was estimated by building the longer railroad.

The question whether award might be made to the General Construction Co. without readvertising to avoid delay and unfair action to the company was submitted to the Comptroller General, whose decision, in part, is as follows:

"Bids for performing the work at the location of the railroad covered by the specifications were advertised for and submitted on a unit price rather than on a lump-sum price basis, and by applying that method of determining costs to the building of the railroad at the changed location with its additional mileage, the total consideration is merely increased, and the unit prices submitted by the bidders are not affected. A contract to cover the work as now contemplated may therefore be entered into with the General Construction Co. on the basis of its unit price bid without readvertising." (Comp. Gen. Decision A-20621, November 18, 1927. 5 Comp. Gen., 508 distinguished.)

The Design and Construction of Dams

For nearly 40 years "Wegman on Masonry Dams"¹ has been the first and last word on dam construction. The latest edition of his book, published in 1927, promises to maintain that standing. The first edition, issued in 1888, had 106 pages. The fourth edition, issued in 1897, which was the first owned by me, had 250 pages. The latest, the eighth, has 740 pages.

It is equally valuable for the student and the practicing engineer, because of its discussion of theory and illustrations of practice. The discussion of multiple arch dams by Fred A. Noetzli, consulting engineer of Los Angeles, will be welcomed by all who are concerned with the twin questions of safety and economy. Engineers in the Reclamation Bureau will find descriptions of nine dams built by the bureau. These are the Roosevelt Dam in Arizona, Pathfinder and Shoshone Dams in Wyoming, Arrowrock Dam and Boise Rolling Dam in Idaho, Colorado River Roller Crest Dam in Colorado, Gibson Dam in Montana, Elephant Butte Dam in New Mexico, and the proposed Boulder Dam across the lower Colorado. The next edition of this work will no doubt contain a description of the Owyhee Dam, plans for which contemplate a structure higher than any dam now in existence.—*Elwood Mead.*

¹ The book is published by John Wiley & Sons, N. Y., and costs \$17.50.

Use of Water Outside of Watershed

In *Galiger v. McNulty* (1927), 260 Pac. 401, the Supreme Court of Montana makes the following statements anent the use of water in that State outside the watershed from which the supply is derived:

Waters primarily belong in the watershed of their origin, if there is land therein which requires irrigation. In this case the waters were taken out to be used in the alien watershed, where and after being so used they could not return to the original stream either by percolation, seepage, or otherwise; hence they were lost to the area in the original watershed. In this case, the right of the appealing defendants was acquired many years ago, and their right to the use of these waters in the alien watershed for placer mining purposes is not here controverted and has but an incidental bearing upon the question presented. Courts have many times sustained such foreign appropriation, and perhaps each case would be determined upon its own individual merit. It is sufficient here to say that the right to the use of this water for placer mining purposes by the appellants has been sustained, but it may be appropriate to remark that the burden placed upon the water should not be added to, to the detriment of appropriations made for irrigating lands within the area of the stream from which the water is diverted. The question of such appropriations has been heretofore before this court, but in an imperfect manner, and the following cases may be referred to: *Spokane Ranch & Water Co. v. Beatty*, 37 Mont. 342, 96 P. 727, 97 P. 838; *Lokowich v. City of Helena*, 46 Mont. 575, 129 P. 1063; *Carlson v. City of Helena*, 43 Mont. 1, 114 P. 110.

Railroads Are Helping Project Settlement

The appreciation of the Bureau of Reclamation is due the western railroads for the fine work they are doing in helping to attract settlers to the reclamation projects.

At the present time particularly, the Chicago, Burlington & Quincy Railroad is bending every effort to bring settlers to the North Platte Valley and to the Willwood division of the Shoshone project, Wyoming, and plans later to concentrate on the Riverton project in the same State. The Northern Pacific and the Great Northern roads have spent much time and money in endeavoring to bring settlers to the Lower Yellowstone project, Montana-North Dakota. The Orland project, California, is receiving the active support of the Southern Pacific Railway in calling attention to land available for settlement there. The Grand Valley and Uncompahgre projects, Colorado, are under the watchful eye of the Denver & Rio Grande Western Railroad with a view to stimulating settlement; and the North Platte project is receiving material help from the Union Pacific System. Much of the recent settlement activity on the Rio Grande project, New Mexico-Texas, is due to the judicious advertising of the Santa Fe; and the Riverton and Belle Fourche projects have both profited by the active interest and support of the Chicago & North Western Railway.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, attended the hearings before the subcommittee of the House Committee on Appropriations in charge of the State Department appropriation bill, to support items in the deficiency and regular appropriation bills providing funds for carrying on the work of the International Water Commission, United States and Mexico. Doctor Mead was accompanied by Miss Mae A. Schnurr, secretary to the commission.

R. F. Walter, chief engineer, spent several days during December in the Washington office in connection with the hearings before Congress on the appropriation bill.

Paul W. Bear has resigned from the position of rate clerk in the Denver office.

I. E. Houk, of the Denver office, represented Chief Designing Engineer Savage at the meeting in Portland, Oreg., of the special committee on irrigation hydraulics, one of the research committees of the American Society of Civil Engineers.

Recent visitors to the Yuma project included Louis C. Hill, consulting engineer; and Superintendent Gaylord and Division Engineer Corrigan of the Los Angeles division of the Southern Railway.

Stony Gorge Dam, Orland project, was visited during the month by Chief Designing Engineer Savage and Engineer Steele of the Denver office; and by G. C.

Green, field engineer, and Walter Dreyer, designing engineer of the Pacific Gas & Electric Co., who also inspected the structures and concrete lining on the distribution system of the project.

Walker R. Young, construction engineer, Kittitas division, Yakima project, presented a paper at the meeting of the Washington Irrigation Institute in Wenatchee on the subject "Development plans on the Kittitas division of the Yakima project, Washington."

Hon. O. C. Moore, former Governor of Idaho, was a recent caller at the Washington office.

John G. Marzel, formerly employed on the Yuma, Uncompahgre, North Platte, and Rio Grande projects as an assistant engineer, visited the Washington office recently.

The following delegation representing the Columbia Basin Irrigation League from the Pacific Northwest visited the Washington office recently: Hervey Lindley, Seattle, president of the league; R. N. Calkins, Chicago, vice president, Milwaukee Railroad; Harlan I. Peyson, Spokane, past president, Spokane Chamber of Commerce; Dr. O. M. Lanstrum, Helena, Mont.; C. E. Arney, Spokane, representing Mr. Donnelly, president Northern Pacific Railway; Allison W. Laird, manager Potlatch Lumber Co.; Joel L. Priest, Boise, representing President Gray of the Union Pacific Railway; E. H. Van Ostrans, Coeur d'Alene, Idaho, president, Craig Mountain Lumber Co.; L. C. Gilman, Seattle, vice president, Great Northern Railway Co.; H. F. Hunter, Chicago, general agent, Milwaukee Railroad.

Salt River Project Makes Big Payment

Statements have been current in the press about the failure of the reclamation fund to revolve, and the impression widely prevails that the contract obligations of the water users on the Federal irrigation projects are not being met. Wherever this impression is held it is erroneous. Since the passage of the adjustment act payments of the full amounts due the Government are the rule and delinquencies the exception.

An illustration of this is furnished in the receipt by the Bureau of Reclamation of a check for \$708,951.14 from the Salt River Valley Water Users' Association in payment of one year's construction charges of the Salt River irrigation project, Arizona.

This check is for the largest amount ever received on yearly construction payments in the history of the Bureau of Reclamation. It makes certain that the payments of construction charges by the water users on the Federal irrigation projects for the fiscal year 1928 will be greater than in any previous year.

FORM 11 4-4-27 10M

Voucher No. 11-199TO THE TREASURER OF THE
Salt River Valley Water Users' Assn.Check Nº 54901Phoenix, Ariz., Nov. 25 1927Pay to the Order of Commissioner, Bureau of Reclamation \$708,951.14
Seven Hundred Eight Thousand Nine Hundred Fifty One and 14/100 Dollars.

IN FULL SETTLEMENT OF ATTACHED STATEMENT

TO THE
VALLEY BANK

PHOENIX, ARIZ.

By [Signature]

TREASURER

Salt River Valley Water Users' Association

By [Signature]

PRESIDENT

[Signature]

SECRETARY

TEAR OFF ON THIS LINE AND DEPOSIT ABOVE CHECK. RETAIN SETTLEMENT SHEET

Salt River Valley Water Users' Association

TO Commissioner, Bureau of Reclamation

PAYEE

CHECK ATTACHED IS SENT YOU IN FULL SETTLEMENT OF THE FOLLOWING ACCOUNT

This speaks for itself

U. S. GOVERNMENT PRINTING OFFICE: 1923

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilde Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Designing Engineer; E. B. Dehler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	R. C. Walber.....	R. C. Walber.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	H. M. Schilling.....	J. P. Sieheneicher.....	.....	E. E. Roddis.....	Billings, Mont.
King Hill ³	King Hill, Idaho.....	.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	E. E. Chahot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	Erle W. Shepard.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Huhbell.....	L. J. Windle.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Fiock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt Lake Basin.....	Salt Lake City, Utah.....	E. O. Larson.....	.....	.....	.....	.....
Salt River ⁷	Phoenix, Ariz.....	.....	.....	.....	.....	.....
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Provo, Utah.....	.....	.....	.....	.....	.....
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Hermiston, Oreg.....	.....	.....	.....	.....	.....
Uncompahgre.....	Montrose, Colo.....	L. J. Foster.....	G. H. Boit.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Vale.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voven.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Yakima.....	Yakima, Wash.....	J. L. Lytel.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
Yuma.....	Yuma, Ariz.....	P. J. Preston.....	H. R. Pasewalk.....	E. M. Philehaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

North Platte, Guernsey Dam.....	Guernsey, Wyo.....	F. F. Smith ¹².....	.....	L. J. Windle.....	Wm. J. Burke.....	Mitchell, Nebr.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gihson Dam.....	Augusta, Mont.....	Ralph Lowry ¹³	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹³	C. B. Funk.....	.....	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Valley Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Resident engineer.

¹³ Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Cache la Poudre investigations.....	Denver, Colo.....	Thomas Hawthorne.....	Poudre Valley Water Conservation Association
Middle Rio Grande.....	Albuquerque, N. Mex.....	C. C. Elder.....	Middle Rio Grande conservancy district
Columbia Basin Project.....	Lind, Wash.....	B. E. Hayden.....	.....
Truckee River.....	Reno, Nev.....	A. N. Burch.....	.....
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	.....
Southern investigations.....	Washington, D. C.....	George C. Kreutzer and C. A. Bissell.....	States of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Tennessee.



DAIRY HERD ON THE ORLAND PROJECT, CALIFORNIA, WHERE A NUMBER OF EXCELLENT FARMS ARE FOR SALE BY THE BUREAU

NEW RECLAMATION ERA

VOL. 19

FEBRUARY, 1928

NO. 2



A PRIZE-WINNING SHORTHORN ON THE YAKIMA PROJECT, WASHINGTON



A DAIRY HERD ON THE SALT RIVER PROJECT, ARIZONA

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.
Price, to others than project water users, 75 cents a year

HUBERT WORK
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

FEBRUARY, 1928

No. 2

Interesting High Lights on the Federal Reclamation Projects

ONE million dollars more flowed into the Yakima Valley in 1927 than in 1926 for agricultural, dairy, livestock, and manufactured products. Returns for 1927 were \$41,666,503 compared with \$40,589,170 in 1926, according to the annual report compiled by the Yakima Morning Herald.

BY the end of the year the Ambursen Dam Co., contractors for the Stony Gorge Dam, Orland project, had covered the last of the foundations with concrete, which had been built up to a height that would not be seriously damaged in case of flood.

ORGANIZATION of farmers' cooperative marketing associations continues on the Grand Valley project, of which there are 10 now organized or in process of organization. These cover the greater portion of the agricultural produce raised on the project. Effort is now being made to consolidate certain allied organizations to reduce overhead.

THE cheese factory opened recently in Montrose, Uncompahgre project, is increasing its operations. It is anticipated that this industry will have a beneficial effect in increasing the dairy herds in the valley.

IT is reported that 200 farms have been sold in Canyon County, Idaho, which is all in the Boise Valley, since October 28, and that 60 per cent of these sales were made to home seekers from other States.

THE Utah-Idaho Sugar Co. is engaged in the contracting of sugar-beet acreage on the Milk River project for 1928. At the end of the year the Chinook division showed an increase of more than 50 per cent over the 1927 acreage, and on the Malta division 712 acres had been promised.

MORE than \$91,000 was distributed to turkey growers in the vicinity of Rupert, Minidoka project, as a result of the Thanksgiving and Christmas marketing seasons. Large shipments were also made from Burley.

FOUR thousand clips of wool were sold recently by the Mini-Cassia Wool Pool at 35.26 cents a pound. This is reported to be the highest price paid in the State this season. The clips all came from project farm flocks.

DURING the past year 14 of the farms on the Lower Yellowstone project on which options were held by the Government were sold to settlers, and about the same number of farms not listed with the Government.

THE number of chickens on the Newlands project has almost doubled during the last five years, more than 82,000 being reported at the close of the year. A large increase is in prospect through the development of the winter and early spring broiler industry.

THE turkey pools on the Newlands project operated through the efforts of Farm Bureau at Thanksgiving and Christmas saved the growers \$15,000. Just another good argument that organization and scientific marketing and education on the production end of farm products are just as essential as owning good land and water rights to make it productive.

THE Churchill County Bank on the Newlands project says that "we find that most of our borrowers have paid their interest in full to December 31, 1927, and a great many have favored us with a substantial reduction on the principal through this year's operations."

THE force of A. Guthrie & Co., who have the contract for the construction of Echo Dam, Salt Lake Basin project, moved onto the work on December 12, and immediately started camp construction. At the end of the month eight buildings had been constructed, a bridge had been built across the Weber River below the damsite, and a road graded to the west abutment of the dam. Clearing of the damsite was also in progress.

INCREASING interest in dairying is being shown on the Yakima project, and an effort is being made to organize a finance corporation at Sunnyside to assist in the purchase of dairy cattle.

EXPENDITURES totaling more than \$3,000,000 during 1927 were made in Yakima Valley towns and rural districts for new buildings, municipal water and sewer systems, pumping plants, expansion of power lines, and other improvements, in addition to building permits totaling \$873,564 issued in the city of Yakima. Included in this total was \$460,000 for cold and common storage plants and warehouse improvements at various points in the valley.

ONE homesteader who had previously made entry arrived on the Riverton project during the month, established residence, and began preparations for farming in 1928. One applicant and three other prospective settlers visited the project. One applicant was accepted, executed water rental application, and made homestead entry. This is the fifth applicant to make his initial payment for water and the third to make actual homestead entry.

ON the Willwood division, Shoshone project, 38 farm applications had been filed up to the end of the year and 16 homestead entries had been completed.

Reclamation Settlement Conference to be Held in Washington, D. C.

February 14 and 15, 1928

INVITATIONS have been extended by Hon. Hubert Work, Secretary of the Interior, to individuals and representatives of various organizations interested in the problems of settlement on the irrigations projects of the Bureau of Reclamation, to attend a conference in Washington, D. C., on February 14 and 15, 1928. The Secretary's letter and a statement by Dr. Elwood Mead, Commissioner of Reclamation, follow:

THE SECRETARY OF THE INTERIOR,
Washington, January 10, 1928.

DEAR SIR: A conference was held in Washington two years ago at which land settlement and farm development under reclamation projects were the main subjects of discussion. Those who attended that conference believed it was worth while.

The majority of those in attendance had an intimate acquaintance with what takes place in the development of an irrigation project. There was general agreement that our reclamation program lacks something essential to the best results, both as regards the well-being of the settler and his family, and the financial returns to the Government. What is needed are measures which will hasten settlement and put the water and land to the best use.

Since that time we have had opportunity to observe the operation of a series of laws enacted by Congress to improve the human and economic features of reclamation. It is the conclusion that this increased attention to the human problems has been amply justified by results. It has brought about better relations between the Government and the water users and a marked improvement in farm practices.

While it is recognized that attending a conference in Washington involves a considerable expenditure of time and money, it is believed that the benefits which arise justify the sacrifice. This view has been expressed in numerous letters from people interested in irrigation development.

A cordial invitation is therefore extended to you to attend the second meeting, to be held in the auditorium of the Department of the Interior, February 14 and 15, 1928. The statement prepared by Commissioner Mead, which accompanies this invitation, will explain to you some of the economic and social questions with which the bureau is confronted, and in the solution of which your cooperation is invited.

Sincerely yours,
HUBERT WORK,
Secretary.

[Inclosure.]

Advance Statement by the Commissioner of Reclamation on Economic Conditions on the Reclamation Projects

For the information of those proposing to attend the Reclamation Settlement Conference, Washington, D. C., February 14-15, 1928

THE extent of the irrigated area and the high acre cost of irrigation works now being built in this country make it desirable that attention be given to every factor that will contribute to efficiency in construction, to rapidity of farm development, and to the well-being of irrigators.

This conference is not called to meet any immediate crisis. The results in the operation of existing works, during the past year, have been most satisfactory. In payment of charges, in value of crops grown, in improved morale of water users, they will compare favorably with any year since Federal reclamation began. Not only do the results under completed works justify Federal reclamation, but everything indicates that the Government must be the chief agency in the future extension of the irrigated area. Private irrigation development under the high construction costs and small returns from farming which now prevail is not profitable. With us, as in nearly all other countries, irrigation development in the future will have to be carried out as a national policy. To justify this there must be more than a creation of wealth. There must be farm ownership instead of tenancy. There must be attractive living conditions as well as a successful agriculture.

RECLAMATION POLICIES SHOULD CHANGE WITH CHANGING CONDITIONS

To achieve these results reclamation methods and policies must change with changing conditions. Reclamation now is confronted with higher costs growing out of the great war, the disappearance of public land, the necessity of buying privately owned land, the higher costs of transportation, and the greater expense of cultivation.

This leads to the belief that we should, in the future, regard the subdivision of land, the limitation of its purchase price to prevent speculation, the working out of programs of cultivation and marketing, and the provision of credit to aid in completing necessary farm improvements, as essential parts of reclamation.

We have not as yet given the necessary attention to these matters, and this omission causes the Bureau of Reclamation to look with apprehension on what will happen when the costly works now under consideration are completed. Unless provision is made for doing more than is now being done, or which the bureau is authorized to do, it is certain that settlement will be long delayed, improvement of farms will be costly, and the social and economic results far less satisfactory

than could be obtained if these things are thought out and provided for in advance.

THE RELATION OF SETTLEMENT TO THE SOLVENCY OF NEW PROJECTS

At present the Government holds a lien on the unimproved, unpeopled lands under projects, as a security for the repayment of construction costs, but unless these lands are settled and cultivated they are a liability rather than an asset. Owners of unimproved land derive no benefit from irrigation works and can not long pay reclamation charges. Solvency depends on prompt settlement and improvement of the irrigable land. Provision for this is needed to insure the solvency of the following Government projects:

Name	Cost	Total acreage	Acreage requiring settlement	Number of settlers needed (80-acre unit)
Kittitas.....	\$11,000,000	72,000	37,000	460
Owyhee.....	18,000,000	115,000	75,000	940
Vale.....	3,600,000	30,000	30,000	375
Payette.....	7,500,000	47,000	47,000	590
Minidoka.....				
Gravity extension.....	5,000,000	80,000	40,000	500
Riverton.....	4,500,000	60,000	59,500	745
Willwood.....	1,500,000	12,000	11,000	140
Greenfields division.....	5,500,000	93,000	71,000	890
	56,600,000	509,000	370,500	4,640

The above table shows that the Government is investing \$56,600,000 in irrigation works, but this is not reclamation any more than an empty building is a factory. There will be no income nor benefit from the investment until there are settlers, houses, leveled fields, and crops growing. These are the things which create earning power and are included in the estimates and plans of most foreign countries.¹ They will cost for these projects not less than \$36,000,000, made up of the following items:

Advertising and placing of settlers on the land.....	\$500,000
Clearing and preparing the land for irrigation.....	10,000,000
Erecting houses, fences and necessary farm buildings.....	10,000,000
Farm equipment.....	7,500,000
Cultivation and living expenses the first year.....	5,000,000
Purchase of 200,000 acres privately owned.....	3,000,000

Much of the land on these projects is owned by nonresidents, comparatively few of whom intend to settle on and cultivate the land themselves. They expect to sell to new settlers but there is no coordinated program for subdivision, sale, or settlement. Very few of those who desire to become farmers have the money or credit needed to provide the necessary improvements. Forty-five per cent of the settlement inquiries that come to the Bureau of Reclamation are from people who have less than \$2,500, while the average cost of improving and equipping a farm will be double this sum. Only 7 per cent have \$5,000 or over, or enough to improve and equip a farm without borrowing money. Unless some avenue of credit is provided by which the settlers can

without delay improve and equip their farms, water-right payments will not be made and many settlers will fail.

Much of this land has irregular contours with slopes of varying steepness. Farms ought to be laid out to fit these contours. In this way the cost of irrigation would be lessened and economy in the use of water promoted. But to do this, the individual farms embraced in a considerable area should be brought under one ownership or control so that farms can be laid out to meet the future requirements of irrigation without reference to existing boundaries.

The question arises whether some agency should buy these lands at prices fixed by independent appraisal and then lay out the farms, or should the lands be placed under a trustee who would subdivide so as to secure the best results regardless of present ownerships? If this were done the boundaries of farms would conform to topographic features and to irrigation ditches, drains, and roads. There would be a saving in the cost of laterals, bridges, and roads. It would give more direct access to towns and lessen the expenses of cultivation. The control of these lands by one agency would lessen settlement expenses and permit a more efficient selection of settlers. At Kittitas a tentative subdivision in accordance with these principles has been worked out, but it showed that many farms would embrace land now owned by two or more individuals. One owner unwilling to cooperate may disrupt the whole program.

URGENT NEED FOR FARM DEVELOPMENT ON OLDER PROJECTS

During the past 15 years the Bureau of Reclamation has been struggling to secure sufficient farm development on the Milk River, Lower Yellowstone, and Belle Fourche projects to make them solvent enterprises. All are where sugar beets are profitably grown, where dairying, lamb feeding, and the growing of vegetables are possible and profitable. The projects have been operated at a loss, because only a fraction of the land is settled and cultivated, as is shown by the accompanying table.

The irrigation works on these projects now provide water for 215,070 acres of land, of which only 89,700 acres grew cultivated crops in 1926. Hundreds of settlers are needed. They should be good farmers.

Beet-sugar factories have been built on Milk River, Lower Yellowstone, and Belle Fourche projects. They are needed on all others. But to give these factories a living income there must be more settlers and more acres of sugar beets

grown. A revolutionary change in crops and agricultural methods is required. Grain and native hay must give way to dairy farms and to higher priced crops. Large areas must be subdivided into small farms and farm improvements must be provided which will make these farms real opportunities for honest, industrious people.

Project	Cost to June 30, 1927	Operating cost (annual)	Acres irrigable
Milk River.....	\$7,421,100	\$60,000	73,250
Lower Yellowstone.....	3,175,600	70,000	58,250
Riverton ¹	2,843,500	6,000	9,000
Belle Fourche.....	3,566,125	75,000	74,570
Total.....	17,006,325	211,000	215,070

Project	Acres irrigated in 1926	Acres not irrigated	Number of settlers needed (80-acre unit)
Milk River.....	18,800	54,450	680
Lower Yellowstone.....	23,330	34,920	410
Riverton ¹	280	8,720	110
Belle Fourche.....	36,260	38,310	480
Total.....	78,670	136,400	1,680

¹ Opened 2 years.

Efforts in 1927 to secure settlers on the Lower Yellowstone and Belle Fourche projects showed that good settlers can be secured if the farm is sufficiently improved to enable the settler to begin farming, which he understands doing; that is, the farm must have a house, outbuildings, and some land prepared for irrigation. There is little demand for unimproved farms. The owners of the land have been unable or unwilling, except in a few instances, to provide these improvements. Efforts to find local agencies that will undertake this work have so far been unsuccessful.

In a recent bulletin issued by the University of California,² it was estimated that in California alone 1,200,000 acres of land supplied with water was not being irrigated, and that at the present rate it will take 12 years to settle this land. Twelve years of taxes added to the farmer's cost before he begins improving the farm is a serious handicap. It shows the need even in that favored State of something that will enable home seekers to overcome the obstacles that confront every one who attempts to change raw land into farms.

During the past year the Government has had the generous and efficient aid of railroads, chambers of commerce, and State organizations, in efforts to secure settlers under completed works, but the

² Problem of securing closer relationship between agricultural development and irrigation companies by David Weeks and Charles H. West.

¹ Marshall Dana, editor Journal, Portland, Oreg.: From the statements that have been made I have gained a partial idea of the costs of reclamation in the various localities—namely, Hawaii, \$300; Japan, \$500; Mexico, \$150 or more; Palestine, about \$200; California, \$50 to \$250; and Pacific Northwest, \$30 to \$200. Peru and Australia I did not get, and should like to ask for more information on that subject.

William Cattanach, chairman, State Rivers and Water Supply Commission, Victoria, Australia: We would reckon, in some cases, \$150 to \$200 as a very reasonable figure for reclamation, but for intensified agriculture it will go higher—about \$300 to \$400 an acre. It depends entirely on the use to which the land is going to be put. It is a varying quantity according to the nature of the land, the crops, etc., but the crops generally are of greater value where the land is more expensive to bring under irrigation and cultivation.

Thomas Forsyth Hunt, University of California, Berkeley, Calif.: What does the term "reclamation" mean? Does it mean how much does it cost to develop an irrigation enterprise, or the cost of building the enterprise, cost of leveling the land, grading, and so on to the point where a man can go on the land? In Australia and some other countries, of course, they go much further than we do and build houses, etc., before they consider that they have completed their reclamation project.—*Proceedings of the First Pan Pacific Conference on Education, Rehabilitation, Reclamation, and Recreation, held at Honolulu, Hawaii, Apr. 11 to 16, 1927.*

relatively small results obtained in comparison with the effort and money expended show that something besides advertising and personal solicitation is needed.

QUESTIONS FOR CONSIDERATION OF THE CONFERENCE

The following topics are submitted to the conference for consideration:

1. Is there need for credit in the building of houses on the unpeopled farms of the Milk River, Lower Yellowstone, Belle Fourche, and Riverton projects?

2. Is there any source from which the money needed can now be obtained, assuming that the owners of the land will give a first mortgage to insure payment of money spent on these improvements?

3. What should be done to bring about coordinated action in the settlement of lands privately owned which will insure subdivision of the land in accordance with topography, the fixing of prices to agree with its productive value, and its sale on long-time, amortized payments, with a rate of interest which the settler can afford to pay?

4. Assuming that a credit fund for aid in farm development is necessary, what agency should provide that fund, the State or the Federal Government? What interest should be charged on these advances and what should be the time of repayment?

5. What should be done to lessen the evil of tenancy on a number of the projects?

6. Should the construction of irrigation works cease until some plan of settlement and farm development has been approved and put into operation?

7. Should Congress be asked to consider between now and its next session the need for further legislation to promote settlement and farm development?

ELWOOD MEAD,
Commissioner.

DURING a recent month the Malin Cheese & Produce Co., Klamath project, paid the farmers in the vicinity of Malin \$6,600 for milk and cream.

MAPPING of the dairy cow population on the Belle Fourche project shows a favorable grouping of cows along main roads, feasible for the establishment of truck hauling in case a cheese factory is located at Newell.

Settlement of Waste Lands in Colombia

THE following article is from a recent issue of the International Review of Agriculture, published by the International Institute of Agriculture of Rome, Italy:

"An agreement has been made between the Government of Colombia and the Compañía General de Negocios, the headquarters of which is at Barranquilla, for the colonization of a belt of waste lands in the regions of the Sierra Nevada de Santa Marta (Department of Magdalena). The whole area is 123,500 acres, not including those lands which are classed as national forest. The company has the right of selecting the part on which it will undertake to plant one or more agricultural colonies. The number of settlers to be thus established must not be less than 2,000, of which 18 per cent must be immigrants brought by the company at its own expense and risk.

Southern Delegates Meet in Conference

On January 24, 1928, a number of representative men from the South, interested in opportunities for planned group settlement in that section and in a more advanced type of agriculture, met in Washington, D. C., to discuss with their Senators and Congressmen plans for the future.

The delegates to the meeting comprised largely the members of the various southern reclamation committees. Inspiring and forward-looking addresses characterized the morning and afternoon sessions and were a conspicuous feature of the dinner in the evening, which was attended by a large number of Senators and Congressmen from the Southern States and administrative officials of the Department of the Interior and the Bureau of Reclamation.

"The company, in addition, undertakes to build convenient hygienic houses, for ownership by the settlers on payment of the cost price plus 18 per cent, also to construct the roads required for colonization purposes. If required by the development of the colony, the company will also be required to take initial measures for the foundation of one or more urban centers.

"The Government, on its side, undertakes to make a grant toward the construction of roads to the amount of 3,500 pesos per kilometer, and to pay to the company the sum of 50 pesos for each settler.

"If the lands which are the subject of the agreement acquire increased value in consequence of the work done by the company, such increase in value belongs of right to the company.

"The agreement will be for 17 years. Clauses are inserted stating the contingencies in which the Government may declare the agreement to be void.

"The company has to carry out certain preliminary work before the arrival of the settlers. A complete inquiry has to be made into the agricultural possibilities of the territory to be colonized, and a detailed plan of organization has to be formulated, both to be ready for submission to the Government of Colombia within a period of 20 months from the time of the signing of the contract. This preliminary work will also include provision for the erection or purchase in Santa Marta of a building suitable as a lodging for settlers on their way through, and also for the construction on the territory to be colonized of buildings for housing settlers during the time occupied in their final installation on their respective plots. In addition one or more experimental farm plots, of at least 494 acres each, will have to be planted in advance, on which studies can be made of the agricultural possibilities of the various parts of the colony. These will make it possible for the settlers to obtain what they need for beginning work—e. g., livestock, seeds, etc. At the expiration of the agreement these plots will become national property. Arrangements are also to be made in advance by the company for establishing a store, where the settlers can buy household utensils, farm implements, and other commodities which will be sold to them at cost price, plus 15 per cent. By payment of an interest of 7 per cent, the settlers can have the articles they require on credit for the first year, paying off the amount of their debt and interest later by means of a payment of 30 per cent of the value of their crop. Finally the company is under the obligation of equipping a hospital and dispensaries and of organizing an adequate ambulance service."

Economic Notes from the Irrigation Projects

Crop Returns Indicate Prosperity

REPORTS of the 1927 crop returns from the Federal reclamation projects are being received by the Bureau of Reclamation. The following illustrations indicate the remarkable prosperity of these irrigated areas during the past year:

One of the most striking returns is from the Tieton division of the Yakima project, Washington, which has been petitioning for an extension of the period of repayment of charges to the Government. The value of crops grown on this division during 1927 amounted to \$3,379,850, or an average value per cropped acre of \$150.22, compared with \$2,059,950 in 1926, or an average value per acre in that year of \$89.18. This is an increase of nearly \$1,320,000 in the total value of crops, and of more than \$61 in the per

acre value. The per acre value of \$150.22 is reported by J. L. Lytel, superintendent of the Yakima project, as the highest of any year for the Tieton division since the bureau started to deliver water to the division.

On the Carlsbad project, N. Mex., one of the cotton-growing projects of the bureau, the total value of crops in 1927 was \$1,897,890, or \$83.30 per acre, compared with \$1,100,620 in 1926, or \$48.14 per acre. This is an increase in the total value of crops of nearly \$800,000, and in the average value per acre of more than \$35.

On the Klamath project, Oreg.-Calif., where the bureau recently opened to entry 145 public land farm units on the Tule Lake division, all of which were quickly entered by a high class of settlers with

approved qualifications of industry, experience, character, and capital, the crop returns in 1927 amounted to \$1,181,670, or \$30.43 per acre, compared with \$906,750 in 1926, or \$24.40 per acre, showing an increase in the total value of crops of nearly \$275,000, and in the per acre value of more than \$6.

The Orland project, Calif., where the bureau is acting as selling agent for 64 farms in private ownership, reported a crop value in 1927 of \$721,330, or \$54.06 per acre, compared with \$624,650 in 1926, or \$49.19 per acre, an increase of \$96,680 in total value of crops, and nearly \$5 in the average value per acre.

On these four projects alone the increase in value of crops in 1927 over that of 1926 amounted to nearly \$2,500,000.

The Reclamation Fund Continues to Revolve

EVIDENCE that irrigated agriculture is on the upgrade and that the morale of people on irrigation projects is improving is shown by the action of the irrigation districts, water users' associations, and individual water users in the payment of their obligations due the United States. The collections during December, 1927, totaled \$1,590,000, compared with \$574,000 collected during December, 1926.

The Gem irrigation district of Idaho made payment in full on December 19, 1927, of the amount due December 31, 1927.

During the depression following the Great War, this district was in severe financial difficulties, and there was fear at one time that it might not be able to

survive. Now the district has improved production by the building of drainage canals, and has bought some of the unoccupied State lands in order that they might be settled and brought into cultivation. This prompt payment to the United States shows that its finances are in good condition and that it is doing business as a solvent enterprise.

The Nampa and Meridian, the New York, and the Boise-Kuna irrigation districts, operating the Arrowrock division of the Boise project, and the Burley irrigation district operating the Pumping division of the Minidoka project in Idaho, paid in full prior to the due date, obligations due December 31, 1927.

The Northport irrigation district operating the Northport division of the North Platte project in Nebraska met its first payment promptly under its adjustment contract; and the Pathfinder irrigation district reduced its obligation of \$135,000, due June 30, 1926, to \$25,000.

All amounts due from the Malta and Glasgow irrigation districts on the Milk River project in Montana have been paid, and the Fort Shaw irrigation district on the Sun River project has met its obligations.

On December 17 the Hermiston irrigation district, Umatilla project, Oregon, forwarded its check for \$5,500 to be applied on the 1926 construction charge. This cleans up the amount due on June 30, 1926, and materially reduces the amount due in December.

The Shoshone irrigation district and the Frannie irrigation district on the Shoshone project in Wyoming have met promptly all obligations due the United States.

The Lower Yellowstone irrigation district No. 1 on the Lower Yellowstone project in Montana tendered the largest single check ever received by the project office in payment of the amounts due December 31, 1927.

Federal reclamation is on a business basis and the outlook for the future is bright.

Sale of State Lands in Gem Irrigation District

Some interesting points have been noted in connection with the sale of State lands in the Gem irrigation district. About 3,000 acres were sold at prices ranging from \$20 to \$30 an acre, subject to all the old obligations of the district and to the cost of a water right in the Owyhee project. Nearly every tract was sold to a resident of the district. These farmers who have been paying \$7.50 per acre for a year's water charges paid down on the lands purchased about \$13,000 cash. As the men have been farming in the Gem irrigation district for several years, the cash they paid represents savings from farming Gem irrigation district lands during the past rather lean years for agriculture at the same time that the charges above noted were being met.

Sugar-beet Farmers Enjoy Good Returns

The Amalgamated Sugar Co. made a final payment to Minidoka project growers of sugar beets on December 15, distributing \$116,512, which brought the total paid out for the season to \$364,501. The output of the Burley factory was approximately 125,000 sacks of sugar, 13,000 tons of pulp, and 1,200 tons of molasses. A total of 46,567 tons of beets was received at the factory from Minidoka project growers and about 12,000 tons from other localities. A base price of \$7.50 a ton was paid.

The New Townsite of American Falls, Idaho

RECENTLY the residents of American Falls, Idaho, and of many near-by cities and towns dedicated the American Falls Dam on the Snake River. The dam is a concrete gravity structure, flanked by earth embankments on each end. Although only 87 feet high it has a total length of nearly a mile. The reservoir formed by the dam is 25 miles long, averages $3\frac{1}{2}$ miles in width, has a capacity of 1,700,000 acre feet, and submerges 61,000 acres of land.

Construction of the reservoir involved the flooding of a large portion of the old town of American Falls. It was therefore necessary to develop a new townsite above the high-water mark. Under the act of Congress of January 24, 1923, the Bureau of Reclamation acquired a tract of 573.58 acres of land about a mile east and north of the former town, and was given authority to lay out, develop, subdivide, and sell lots in the new townsite.

Active development work started in August, 1923, and was completed in August, 1925. The entire tract for the new townsite was subdivided into 1,580 lots, of which the more central portion, comprising 1,001 lots, or 63.4 per cent, was appraised for sale to the public.

Under a contract with the city of American Falls, the United States agreed to expend on the new townsite approximately the following amounts:

Sidewalks, street and landscape improvements.....	\$96,000
Water works.....	110,000
Sewers.....	74,000
Cost of land.....	62,000
Overhead, engineering, and contingencies.....	103,000
Total.....	445,000

Other clauses in the contract provided for the transfer to the city of an interest in the new sidewalks, sewer system, and landscape improvements in lieu of municipal improvements in the portion of the old town to be taken over for reservoir purposes; and also for the transfer to the city of the water system in the new town site when the United States shall have been reimbursed for its expenditures in the new town. In order to offset in part at least the loss to the city of accrued taxes during the development period of the new town site, the city is also to receive the 10 per cent excess value placed on lots sold under "term" contracts instead of for cash, where such contracts were made before November 14, 1924.

The final cost of development of the town site is as follows:

Right of way.....	\$60,480.00
Clearing and grubbing.....	1,862.54
Street grading.....	21,977.32
Street surfacing.....	15,610.03
Sidewalks.....	44,306.10
Landscape work.....	10,214.13
Sewer system.....	66,630.18
Water system.....	111,155.81
Field cost.....	332,236.11
Camp maintenance.....	\$339.87
Engineering and inspection (including \$17,440.49 for town planning).....	41,128.79
Superintendence and accounts.....	8,618.32
General expense.....	18,193.26
Overhead charges.....	68,280.24
Establishing homes for Government employees.....	400,516.35
Gross cost.....	425,753.26

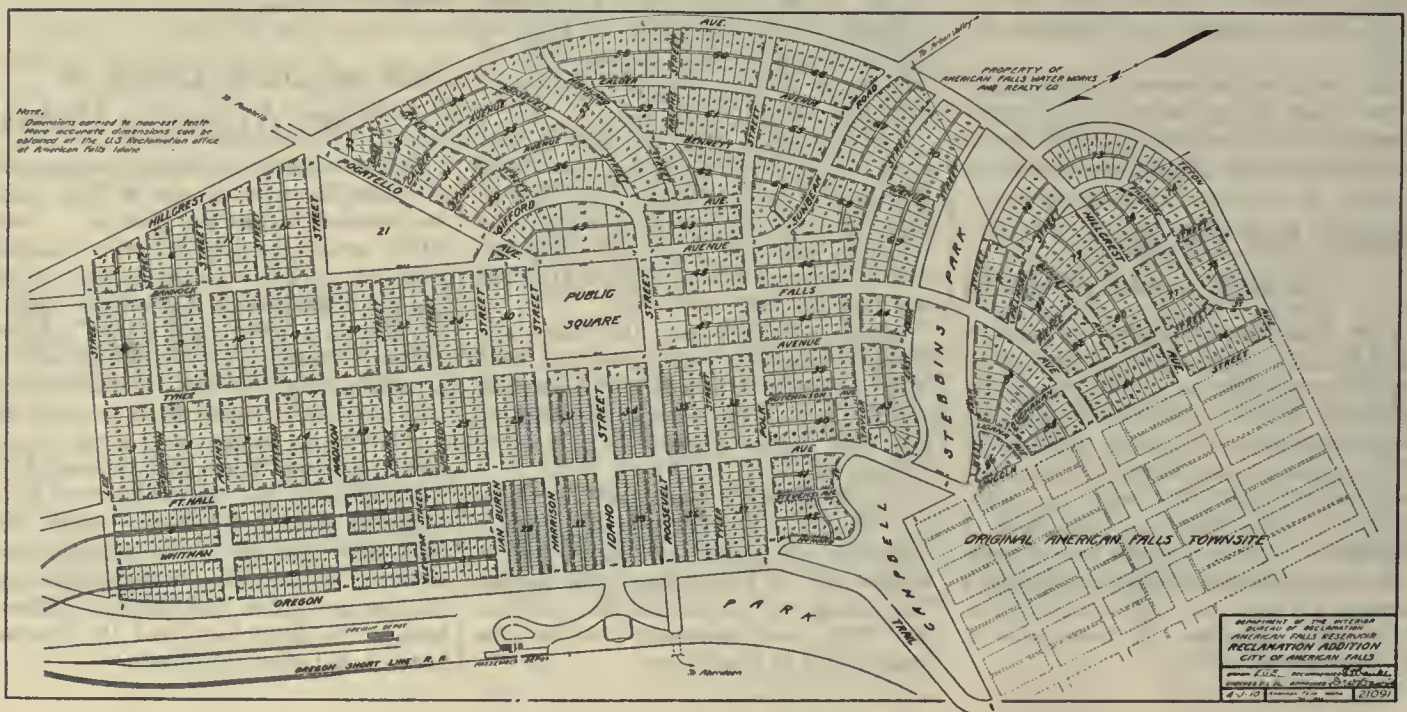
All parts of the new town site are provided with concrete sidewalks, although in some sections of the residence districts

walks are constructed on one side of the street only. Sidewalks in the residence sections are 5 feet wide and in the business district 10 feet. Concrete culverts of the interlocking type are used at street intersections.

Landscape work is a prominent feature of the new town site, involving the development of the public square, the partial development of Campbell-Stebbins Park and the Tourist Park, the planting of trees throughout the entire developed area of the town site, and the provision of an irrigation system to water the trees. Three thousand three hundred and fifty-seven trees and 68 shrubs were set out.

The town site is furnished with an excellent water system. From Rueger Springs, the source of the supply, the water flows through a 14-inch wood-stave pipe a distance of about 3,725 feet to the pumps located at the West Side power plant, and is raised 285 feet to the two-section, concrete-lined reservoir of 1,500,000 gallons capacity. The distribution system consists of wood-stave pipe ranging in size from 4 to 12 inches in diameter. Pipe laid amounts to 56,803.9 linear feet.

To provide homes for employees of the bureau in the new town, it was necessary to move 14 residences, together with outbuildings, from the old town to the new site. It has been the policy to rent these houses to Government employees only, and as rapidly as they become vacant they are sold. At the beginning of November, 1927, seven houses had been sold. The appraised sale price of



Reclamation addition, city of American Falls

these seven houses was \$13,950 and they were sold for \$17,681.33.

After being appraised, lots in the new town site were put on the market in September, 1923, for sale, either for cash or on terms. If sold for cash, they are sold at the appraised price; if on terms, they are sold at the appraised price plus 10 per cent, the usual practice being to collect one-fourth on the date of the contract and one-fourth on each October 1 following until the full purchase price has been paid. On deferred payments interest is charged at 6 per cent per annum. Interest at 10 per cent per annum is charged on bills not paid when due. Up to the 1st of November, 425 lots in the first development had been sold for \$153,457.

In financing the development of the new town site, it was decided that the proceeds from the sale of salvage improvements in the portion of the old town to be flooded would be credited to the

new town site. Every building in the area to be flooded was appraised for sale, and every building was sold. In all, 337 sales were made for \$185,393.45.

The following is a summary of the costs and credits as a result of the development of the new town site:

Field cost.....	\$332,236.11
Improvements, moving and repairing (net).....	25,236.91
Total.....	357,473.02
Overhead.....	68,280.24
Gross cost.....	425,753.26
<i>Credits</i>	
Sale of lots, including 10 per cent excess on term sales.....	153,881.62
Sale of improvements, including 10 per cent excess on term sales.....	185,393.45
Miscellaneous credits.....	9,837.26
Water system operation (net).....	14,049.24
Total.....	368,161.57
Net cost.....	57,591.69

With additional sales of lots and of the remaining Government houses, it is expected that the net cost will eventually be reduced to approximately \$40,000.

has been in operation for some time and is equipped to handle five or six cars of cheese with plant facilities. The total cost was approximately \$13,000. The factories have paid, an average price of 54¾ cents for butterfat for the year 1927. Starting on December 1 we are paying for milk twice a month; that is, on the 10th and 25th. We think that this will materially increase the volume. The increase this November over November last year was 237,514 pounds. The increase in pounds of milk for the 11 months this year was 2,420,274 pounds.

"The Finance Corporation has already placed cows on more than 80 farms. The bulk of the farmers take from 5 to 10 head and a purebred sire. We have brought in 20 purebred bulls, and of the 15 high herds in the Cow Testing Association for the month of November, cows furnished by the Finance Corporation took the following standing—Seventh, tenth, twelfth, and fifteenth. I think this speaks well for the quality of the dairy cattle we have been shipping in. The bulk of the cattle are springing 2-year old heifers, and the reports we have had from the farmers who are just feeding them ordinary beet tops and hay show that the least we have had is 4 gallons and more of them are giving 5 gallons. Where grain is being fed in addition, to roughage, they are giving as much as 5 to 6 gallons."

Dairy Progress on the North Platte Project

EBEN D. Warner, of Scotts Bluff, Nebr., whose activities in financing shipments of dairy cattle to the North Platte project were described in the November, 1927, issue of the *NEW RECLAMATION ERA*, has forwarded the follow-

ing statement concerning the progress of this constructive work:

"At the present time (December 16, 1927) we have brought in 589 head. The cheese factories have been progressing very rapidly. The new centralizing plant



Dairy herd of Joe Gisler, a water user on the Minidoka project, Idaho. High record cow, 906 pounds of butterfat; average of herd of 21 cows, 407 pounds of butterfat per year



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor, *New Reclamation Era*



Rural-minded Folks

LOVE of the land, to live, walk, and work on it, to derive real pleasure and satisfaction from looking out your front door over acres of land instead of across an asphalt street, to have one's mind and heart in all the work that goes on on the farm, these are some of the things that place you in this envied class. Rural-minded folks are not happy in the city for any length of time. More successes are made by people who are engaged in work that they enjoy than any other class.

In many cases the woman has the "lion's" share of farm work. The home,

and everything that that term implies, is her particular charge. By evolving numerous short cuts, and by the use of labor-saving devices she diminishes the time spent on housework. Through her progressiveness she interests herself and encourages her husband in the affairs of the farm. As a result of this teamwork, modern machinery replaces old equipment as soon as it can be arranged, better methods of agriculture are employed with resultant larger and better crops. The progressive rural-minded woman on a farm is worth her weight in gold, and she has the satisfaction of feeling she is a real partner in a worthwhile undertaking.

Elimination of Rats and Mice

The modern housekeeper, of course, no longer climbs shrieking on the nearest chair if she happens to see a mouse run across the floor; much less does she indulge in a fainting spell. Instead, three questions are likely to pop into her head almost simultaneously: "Now, how did that creature get in here?" "What have I left around to attract a mouse?" and "How shall I get rid of him and all his tribe?"

She begins by hunting for any possible openings in the walls, around baseboards, near water or heating pipes, or in closets. She also casts here eye about for traces of careless housekeeping—crumbs scattered, food left uncovered, or in paper packages, starch or waxed paper exposed where mice can gnaw it, or any other tidbits likely to appeal to their wide range of tastes. She may be horrified to find mice tracks on the pantry shelves, in the drawers where she keeps her tea towels, upstairs in closets, in rugs stored in the attic, although she has up to this time never even suspected there was a mouse in here entire house.

Rats, of course, leave similar indication of their presence in gnawed clothing, papers, food supplies. They are to be feared not only because of the damage they do, and the rapidity with which their numbers increase, but because they often carry and convey diseases, kill poultry, and other animals, undermine foundations, and sometimes bite viciously when cornered or attack babies or children while sleeping.

Similar methods of control are used against both rats and mice. The elimination of either pest from a whole community is the end to be desired, but this can only be accomplished by the organized effort of all the citizens. When people realize that rats alone cause over \$200,000,000 worth of damage a year and that this is totally unnecessary waste, they are more willing to take measures to get rid of this expensive pest.

The individual housekeeper can at least make a beginning by closing up all openings through which rats and mice are likely to get into the house. Use a mixture of cement, sand, and broken glass or crockery in such holes if you find any, or cover them with a sheet of metal. If your house has open studding in the walls



Eliminating rats and mice

from cellar to attic they will be used by these pests for runways and passages to their nests. The studding should be closed. Buildings are frequently made entirely rat proof now, when first constructed, by the use of deep cement foundations, but older buildings must be protected as far as possible by closing holes and runways.

A thoroughly clean and orderly house with an exterior that is free of any spot where trash is accumulated is a discouraging place to a hungry rat or mouse. Both animals make nests in litter and rubbish and seek piles of trash to hide under. Both want food. Store all supplies in covered glass or metal containers, which can not be gnawed. Dispose of waste and garbage in tightly covered receptacles, and get rid of any rubbish in the cellar or under the porches or about the garage or yard, where these unwelcome visitors might hide. If you don't possess any traps, get several, both rat and mouse traps. Bait them and set them where you have seen either animal, or near the holes you have found.

If the traps do not eliminate the pests try poisoning with barium carbonate, if poison can be used with safety, where it will not be touched by children, poultry, or pets. This substance is an inexpensive white powder, both odorless and tasteless, and baits containing it are readily taken. The best way to spread poison is to mix it with a variety of foods and try placing different ones about on successive nights. Mix some with such foods as Hamburg steak, sausage, fish, liver, bacon, or cheese. Spread some on slices of vegetables and fruits, such as tomatoes, cucumbers, muskmelons, apples; or mix it with canned corn, or squash, or pumpkin seeds, mashed banana, boiled carrot, or baked sweet potato. Mix another lot with rolled oats, bread, cornmeal, flour, or cake, and with various table scraps. Add water to the barium carbonate when necessary to make the baits soft, or sprinkle the powder over the sliced baits, rubbing it into them with a knife. Use about 1 part poison to 4 parts food.

One way to expose the baits is to put about a teaspoonful of each of several kinds into different paper bags, twist the tops, and drop them in places frequented by the rats or mice. It is well to label these. Another way is to put the bait on small pieces of cardboard. Do not use stale or spoiled food as bait. Uneaten baits should be picked up the next day and destroyed. Do not use baits over again if not taken. Continue to distribute baits until the rats and mice seem to have disappeared. The baits are usually carried into burrows or behind protecting

boxes or furniture and eaten comfortably. The effect of the poison is gradual, and the rats generally have time to return to their burrows before they succumb.

To Clean the Stove

The outside of all stoves should be wiped frequently with a cloth, soft paper, or cotton waste. Grease may be washed off with soap and water. Rubbing the stove with a soft, thick cloth moistened with a few drops of kerosene or light lubricating oil will keep it in good condition, though not polished. For cookstoves especially, many housekeepers consider this sufficient and prefer it to blacking, because substances spilled can be more easily washed off, and flatirons and the bottoms of kettles are cleaner than if stove polish is carelessly used.



Stove cleaner

The stove mop illustrated is very convenient and saves the housekeeper's hands. It was made from an old butter paddle and a small piece of sheepskin by

a woman in Wythe County, Va., as one of the many ingenious improvements in her kitchen, entered in the county "better kitchen" contest.

Nickel trimmings on stoves should be cleaned like other nickel by washing them frequently with hot soapy water and drying them with soft cloth or paper which will usually keep them in good condition. Whiting or some other fine scourer may sometimes be used to brighten nickel that has become dull.

Coal and wood stoves should be cleaned inside frequently and thoroughly in order to save heat and fuel. Ashes should be removed every day, and once a week the soot should be brushed from the bottom of the lids. All flues should be cleaned regularly, especially those under and on top of the oven, through which hot air must circulate to heat it.

When the burners on gas stoves become clogged they may be taken out, brushed, placed in a large pan, and boiled in water to which washing soda has been added in the proportion of one-half pound to 1 gallon, rinsed and brushed, wiped with paper or cotton waste, fitted back in the stove, and dried thoroughly by lighting the gas. The tray under the burners should be removed and washed frequently.

The burners and chimneys on oil or other liquid-fuel stoves should be kept in order in the same way as kerosene lamps. In most makes the burners are detachable, and when they become clogged may be cleaned like those on gas stoves.

The heating elements on electric stoves may be cleaned with water and a soft brush. Any particles burned to char may be brushed out.

Yakima and Yuma Projects Have New Superintendents

J. L. Lytel, for many years superintendent of the Yakima project, Washington, and previous to that superintendent of the Strawberry Valley project, Utah, has resigned, effective January 31, 1928. He is succeeded by Porter J. Preston, superintendent of the Yuma project. The vacancy caused by the transfer of Mr. Preston to Yakima has been filled by the appointment of R. M. Priest as superintendent of the Yuma project. Mr. Priest has been acting superintendent of the project during the absence of Mr. Preston.

THE Beekeepers Association on the Milk River project has been formulating plans for an improvement and increase in the honey industry during the coming season.

Construction of the Willwood Diversion Dam

Concrete gravity dam built in 1922 and 1923 diverts water for the Willwood division of the Shoshone project

By Ioan E. Houk, Research Engineer, Denver Office, Bureau of Reclamation

THE construction of the Willwood diversion dam on the Shoshone River about 10 miles southeast of Powell, Wyo., in 1922 and 1923, provides for the diversion of 320 second-feet of water to an irrigable area of approximately 17,000 acres. This area lies south of the Shoshone River and constitutes what is known as the Willwood division of the Shoshone project.

The dam is a concrete gravity structure 320 feet long, consisting primarily of an ogee spillway section but including a headworks section at the north end. The spillway section is 271 feet long, has a crest elevation 55 feet above the foundation, and is surmounted by a 3-span, pony Warren, riveted, steel truss highway bridge having a reinforced concrete floor. The headworks section is 49 feet long, approximately 70 feet above the foundation, and is surmounted by a reinforced concrete approach to the

highway bridge. One of the accompanying illustrations shows the completed structure with a depth of 4.1 feet of water flowing over the spillway section.

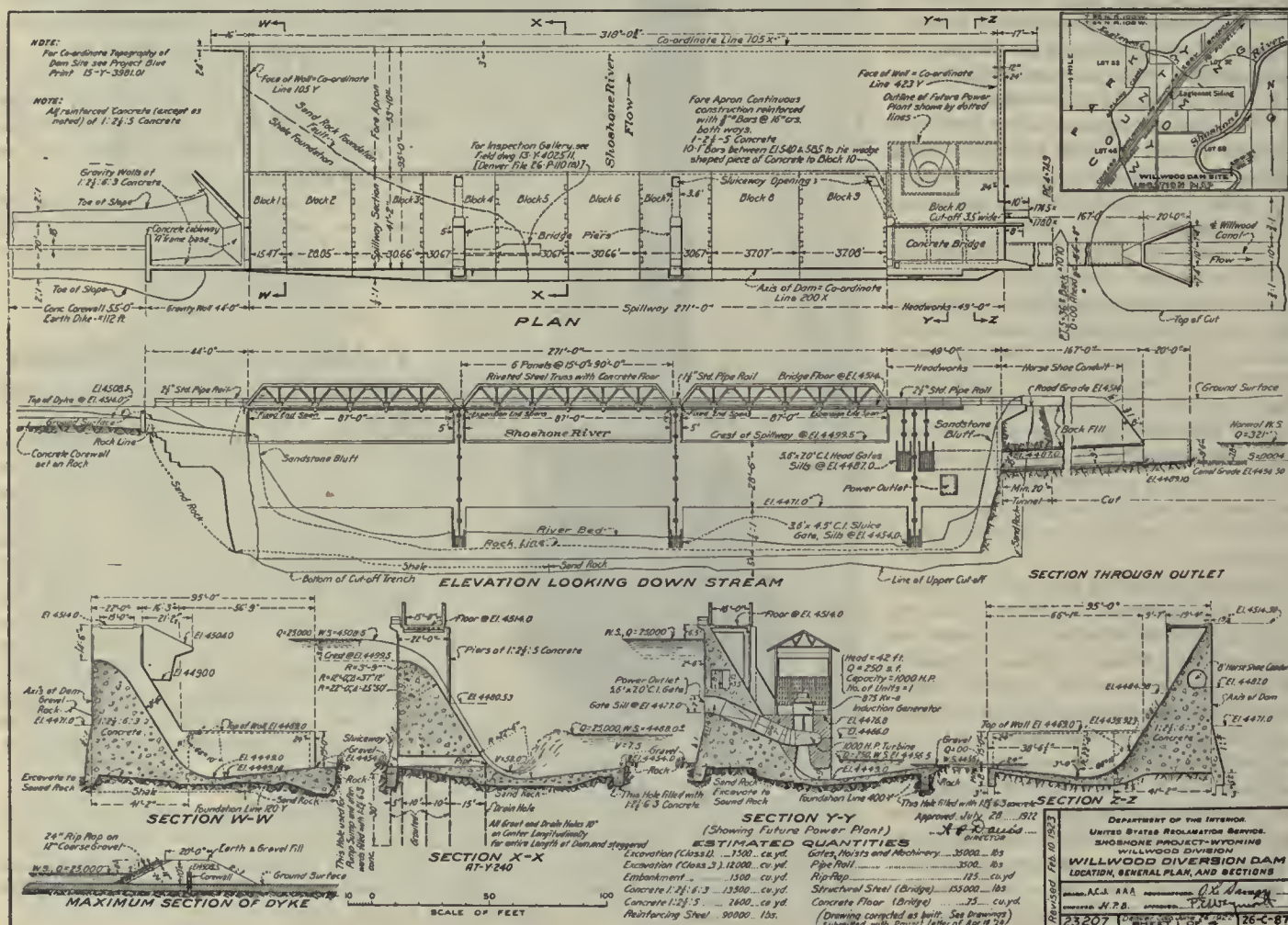
The dam is located in a shale and sandstone gorge about 24 miles below the Shoshone reservoir. The adoption of the present site and height of dam was dependent primarily on the most feasible and economical location of the main canal, the final conclusion reached as a result of nine separate engineering investigations of the Willwood division being that because of the shifting river channel any type of canal or conduit along the cliffs of the river canyon would be less desirable than a canal located on the high bench lands back of the river.

DESIGN OF DAM

The gravity type of design was chosen in preference to the various hollow types because of the horizontally stratified and

seamy condition of the shale and sandstone foundation. It was found that the cost of a hollow overflow dam on such a foundation would be practically as great as the cost of a gravity dam. The gravity sections were designed to be stable under a flood of 25,000 second-feet, a flood which would cause a depth of 9 feet of water on the overflow crest. Allowances were made for uplift pressures over half the area of the base varying from full reservoir pressure at the upstream side to full tail water pressure at the downstream side. A complete description of the engineering phases of the design and construction was published in the Engineering News-Record for October 27, 1927.

Two unusual features of design incorporated in the plans for the Willwood dam were the arrangement of the diversion headworks and the means adopted for preventing erosion of the stream bed below the dam. The latter was accom-



Location, general plan, and sections, Willwood diversion dam

plished by depressing the surface of the apron at the downstream face of the dam, then raising it on a gradual slope to an elevation 5 feet higher at the downstream edge of the apron. This arrangement causes the standing wave or hydraulic jump to occur at the downstream face of the dam as shown in the accompanying illustration of the completed structure, so that the velocity is reduced to a non-scouring value by the time the water reaches the downstream edge of the apron.

The design of the canal headworks is unusual in that the structure is made a part of the dam itself instead of being built as an auxiliary structure at one end of the dam. Water is diverted through two 5.6 by 7 foot cast-iron headgates at the upstream face of the dam; carried to the north abutment through an 8-foot horseshoe tunnel 44 feet long, built within the headworks section; then through a 9-foot, concrete-lined horseshoe tunnel in the rock formation to the open canal section which begins about 167 feet from the north abutment.

The accompanying illustration shows the location, general plan, and typical cross sections of the dam. It will be noticed that cut-off walls were provided at the upstream edge of the dam and the downstream edge of the apron; that three sluiceways, for sand and silt control and also for draining the reservoir above the dam, were provided at the elevation of the river bed; and that a 7-foot circular outlet, for use in a contemplated future power development, was provided in the headworks section. The three sand sluiceways are controlled by 3.6 by 4.5 foot cast-iron sluice gates, operated from the floor of the highway bridge. The power outlet is closed at present by a timber bulkhead. It will ultimately be controlled by a 5.6 by 7 foot cast-iron slide gate.

Transverse contraction joints, fitted with keyways, 24 inches wide, 12 inches

deep, and approximately 6 feet apart, were provided in the overflow section at intervals of about 30 feet along the dam. The apron was reinforced in both directions with $\frac{5}{8}$ -inch square bars, spaced 16 inches apart, and was built as continuous construction without joints.

FOUNDATION CONDITIONS

The foundation for the dam consisted of rather seamy sandstone and shale formations, the sandstone predominating, as shown in the accompanying plans. Although the hardness of the sandstone varied considerably in different parts of the foundation, as a general rule the shale was softer than the sandstone. Moreover, it slacked and disintegrated badly when exposed to the air, so that it was necessary to go over the foundation carefully and remove all slacked material just before pouring the concrete. Wherever the surface of the foundation under the gravity section of the dam dipped downstream, it was terraced off to horizontal planes or with slight dips upstream, the terraces being made from 6 to 8 feet wide with steps about 1 foot high.

The tightness of the rock formations was tested, prior to grouting, by subjecting some of the grout holes to a hydrostatic head of 80 feet, this head being obtained by connecting the holes to the water tank at the mixer plant located on the north abutment. The head of 80 feet amounted to 10 to 15 feet more than the maximum head assumed in designing the structure. Twenty-one representative holes were tested, some in sandstone and some in shale. Holes in the shale seemed to be comparatively tight, but some of the holes in the sandstone took as much as 28 gallons of water per minute.

The foundation and abutments were thoroughly grouted under a pressure of 100 pounds per square inch, grout being

applied in holes drilled approximately 30 feet into rock. The grout holes were spaced 10 feet apart, longitudinally, and were arranged in four lines located as shown in Section X-X of the accompanying drawing. A total of 1,877 sacks of cement and 347 sacks of sand were used in grouting the 130 holes drilled in the foundation, and 185 sacks of cement were used in grouting the 16 holes located at the abutments. The proportions of the grouting mixture varied from one-half sack of cement and 30 gallons of water to $1\frac{1}{2}$ sacks of cement, 1 sack of fine sand, and 10 gallons of water.

Measurements of uplift pressure on the base of the dam, made after the construction work was completed, showed that satisfactory results were obtained from the grouting operations. They also showed that the total resulting uplift did not exceed the value assumed in designing the structure. One line of drain holes was located under the downstream toe of the dam, the holes being spaced 10 feet apart and drilled to depths of approximately 30 feet. These holes were connected to horizontal drain pipes leading to the downstream face of the dam at the lowest practicable elevation; and were also piped vertically through the concrete to the face of the dam, so as to facilitate cleaning.

CONSTRUCTION OPERATIONS

Although some stripping was done by men and teams, the bulk of the excavation was handled by dragline, excavated material being used in building cofferdams or wasted at convenient downstream locations. Rock material was loosened by blasting except in the cut-off trenches. Cut-off trench material was comparatively soft and was chipped out with jack hammers to avoid the shattering of adjoining rock, which would result from shooting. Grout and drain holes were drilled with



Willwood dam, Shoshone project, under construction



Willwood diversion dam. Water 4.1 feet deep on spillway crest

deep-hole tripod drills, using lengths of steel from 6 to 32 feet.

The sand and gravel plant was built on the north side of the river, about 700 feet from the dam, where an excellent supply of material had been located. Stripping and loading was done by dragline. The screening and mixing plant was located in an open cut section of the tunnel at the north end of the dam, the mixer being placed under the aggregate bins where it could be fed by gravity and where it could discharge directly into the hopper which fed the cableway bucket. The bucket was hoisted and carried on the cableway to the distributing hopper and chute, attached to the cableway, where it was automatically tripped and dumped.

Concrete was poured in blocks located as shown on the accompanying plans. The forms for the upstream face and the sides of the blocks were built in place, using 2-inch lumber; those for the downstream face were built in panels 4 by 16 feet in size, using 1-inch lumber. Panel forms built of 2-inch lumber were used altogether when the concreting operations were first started, but were found to be too cumbersome for convenient use.

Stream control during construction was a comparatively simple problem. The river was maintained in its natural channel at the north side of the canyon while excavation and concreting were being carried on at the south side. It was then diverted through the south sluice gate and over one block in the south section of the dam which had purposely been left at an elevation about 2 feet above the river bed, while construction was carried on at the north side. As soon as the concreting in the north section of the dam was brought to a sufficient height the entire flow of the river was diverted at the Corbett Dam, about 8 miles up-

stream, and the closure of the structure effected, the diverted water being carried to the Ralston Reservoir. After the closure the flow of the river was carried through the three sluiceways until the overflow section was completed and ready for operation.

A well-equipped blacksmith and carpenter shop and a compressor plant was located near the work. Two cableway bridges were constructed across the river. One was a foot bridge and the other was used to carry the air, steam, and water pipes for construction purposes, the pipes being placed in a box filled with sawdust so as to prevent freezing. The main cableway was placed over the dam. It consisted of a 420-foot span of 2-inch cable designed to carry a load of 10 tons.

CONSTRUCTION CAMP

The construction camp, consisting of cook house and mess house, nine bunk houses, office, store house, cellar, ice house, bath house, toilet, and garage, was built on the south side of the river. All buildings were constructed of 1-inch lum-

ber, drop siding, and rubberoid roofing, and all were supplied with electricity. Grounds were fenced, the buildings painted, and a neat and orderly appearance maintained throughout. Water was pumped from the river to water tanks set on a platform above the camp and from there piped to the different buildings. Approximately 125,000 M. feet b. m. of lumber were used in building the camp. The camp was planned for 200 men and the maximum employed at any time was 212. An average number of 180 were employed when work was in full progress.

Preparations for construction were begun in July, 1922. Actual work on excavation was begun with men and teams on August 17, and with dragline on October 5; concreting operations were started at the south end of the apron on December 1, 1922; the last concrete was placed in the headworks section of the dam on June 6, 1923; and the highway bridge was opened to traffic on July 23, 1923. All work was done by Government forces except the freighting of supplies and materials, which was done by G. W. Garrell, of Ralston, Wyo., under contract, at unit prices varying from 24 to 45 cents per ton-mile. Most of the hauling was from Eagle Spur, a siding on the Chicago, Burlington & Quincy Railroad, about 2 miles from the dam.

COST RECORDS

Accurate records of cost were maintained from the beginning of the job until all work was completed. The total cost of the structure, including the outlet tunnel through the rock at the north abutment, amounted to \$337,000, approximately \$25,000 less than the estimate. General expense amounted to 5.8 per cent of the above total, cost of superintendence and accounts to 3 per cent, engineering and inspection costs to 3.7 per cent, and camp maintenance cost to 5 per cent. The total quantities, total costs, and average unit costs of the principal classes of work are shown in the accompanying table:

Willwood dam costs

Class of work	Total quantity	Unit	Total cost	Unit cost
Right of way.....			\$192.62	
Excavation, dry earth.....	6,300	Cubic yards.....	2,953.43	\$0.47
Excavation, rock.....	10,286	do.....	30,023.83	2.92
Excavation, rock in tunnel.....	841	do.....	3,452.95	4.10
Cofferdams.....	8,400	do.....	7,193.18	.85
Embankment.....	1,810	do.....	924.31	.51
Backfill.....	449	do.....	398.43	.89
Riprap.....	40	do.....	163.00	4.20
Minor structures.....			332.08	
Gates.....	41,000	Pounds.....	7,074.92	.17
Drainage.....	1,700	Linear feet.....	1,165.81	.69
Grouting, 146 holes.....	4,185	do.....	8,807.22	2.10
Concrete tunnel lining.....	277	Cubic yards.....	5,784.83	20.90
Concrete, plain, 1:2½:6:3.....	16,648	do.....	139,944.25	8.42
Concrete, reinforced, 1:2½:6:3.....	213	do.....	2,351.56	11.18
Concrete, reinforced, 1:2½:5.....	3,173	do.....	44,784.44	14.10
Bridge, structural steel.....	186,550	Pounds.....	22,406.39	.12

Maintenance of Irrigation Structures

THE following instructions concerning the maintenance of irrigation structures were issued recently by R. F. Walter, chief engineer, as General Order No. 473:

General instructions for the maintenance of the works of the irrigation projects of this bureau are given on pages 340 to 344 of the Manual. On account of the many classes of works involved and the varying conditions and limitations under which they must be operated and maintained the instructions in the Manual are given in broad general terms only. Dependence must be placed on the exercise of good judgment in this matter by the responsible field employees and it is gratifying to know that our important works are, in most cases, being properly operated and maintained. This work can generally be performed by the regular force, without greatly increasing the cost of maintenance.

My attention has, however, recently been called to conditions on some of the projects which can be improved and the following comments and instructions are issued for your guidance:

(a) Every reasonable effort should be made, within the funds and means available, to keep up and improve the general appearance of all works and especially the more notable structures, such as important dams and power plants and buildings that are frequently visited and examined by the public or persons acting in official capacities. The adjacent grounds, and especially the parts of structures such as tops of dams, parapet walls, reentrant angles around gate houses, operating platforms, structure intakes, etc., should be kept free of growing or wind-blown weeds, papers, surplus sand or soil and trash of any nature. Landscaping and turfing should be done in so far as possible, as this will go far toward promoting a sense of pride in the works on the part of employees and thus will tend to raise the quality of all maintenance work.

(b) Surplus construction supplies, materials, or equipment should be fully and properly disposed of, or where reserved, should be suitably stored; or assembled and piled in a neat and ship-shape manner. Temporary structures and buildings should be removed as soon as they have served their purpose.

(c) Minor repairs to buildings, roofs, telephone or transmission lines, fences, bridges, etc., should be promptly made at all times.

(d) The liberal use of paint of approved kind and quality and of pleasing color should be encouraged for all suitable surfaces.

(e) The keeping of the working parts of machinery clean and free from dirt and grit and properly lubricated and protected from rust is of prime importance.

(f) Works of a mechanical nature should be periodically inspected, lubricated, and operated at least throughout the operating season to ascertain that they are in good operating condition and to determine needed repairs or replacements. This operation should be done regularly regardless of the need therefor in the routine operation of the project unless prohibited by circumstances such as impermissible waste of water from storage reservoirs or interference with power use. Such works include:

1. Reservoir outlet gates or valves and operating mechanisms.
2. Reservoir spillway gates and operating mechanisms.
3. Important canal control, sluiceway, and wasteway gates.
4. Pumping plants, including penstock gates.
5. Power plants, including control mechanisms.
6. Isolated mechanical devices such as turbines or floats, etc., for operating gates or other purposes.
7. Motive-power devices, such as electric motors, gasoline engines, etc.

8. Remote control apparatus.

(g) The following metal work and machinery should be periodically cleaned and painted:

1. Structural steel gates.
2. Needle valves.
3. Plate steel conduits.
4. Metal flumes.

5. Metal and other work that needs paint to protect it from rust or deterioration or that should be kept painted for the sake of appearance.

(h) Detail report on the condition of the following should be made periodically but at intervals not exceeding one year to this office:

1. Power plants.
2. Pumping plants.
3. Needle valves.
4. High pressure gates.
5. Drum gates.

(i) Special attention should be given in the periodic cleaning and inspection to electrical machinery installed in damp places.

(j) All windows in power plants and other buildings should be kept clean and broken glass promptly replaced.

(k) Suitable cupboard space should be provided for small tools and supplies, repair parts, oils, etc.

(l) All drainage outlets, vents, weep holes, etc., upon which the safety of any structure depends, should be watched and any evidence of improper operating conditions promptly investigated and needed repairs made.

(m) At certain major structures there are special conditions of water, climate, topography, floods, regulation, etc., that may not exist at others. For such structures written instructions covering the care and operation of the principal features to properly meet such special conditions should be prepared for the guidance of the operators. These instructions are not intended to cover routine operation for release of water, but to insure that gates, valves, etc., are examined, repaired, painted, and otherwise so maintained that interruptions in service are avoided.

The study of pedigrees, based on the knowledge of characteristics of the animals composing them, is indispensable to persons wishing to excel as breeders.

Do you know how to recognize the quality of eggs? A good egg has a clear, firm white, an upstanding yolk, a good flavor, and a strong shell.

Booklet on Filing Commands Attention

Favorable notice throughout the United States is being given to a recent publication of the Bureau of Reclamation, prepared by J. W. Myer, chief of the mails and files section of the Washington office, and J. C. Beveridge, jr., principal assistant in the section.

This 52-page booklet gives a complete and very readable description of the office system and the filing system of the mails and files section, including a comprehensive classification of the files under the Dewey decimal system, and numerous illustrations showing the various steps taken in the complicated process of recording, routing, filing, and charging out correspondence.

An up-to-date filing system in the hands of competent employees justifies the cost of installation and operation many times over in saving the time of administrative officers. This booklet tells how this has been accomplished in the Washington office of the Bureau of Reclamation. A few copies are still available on request for distribution to interested persons.

Black Canyon Power and Pumping Plant, Boise Project, Idaho

By L. N. McClelland, Electrical Engineer, Bureau of Reclamation

THE Black Canyon dam on the Payette River, about 4 miles above the town of Emmett, Idaho, was built for the purpose of diverting water into the canals of the Emmett irrigation district and also for diverting water for the lands of the proposed Payette division of the Boise project. The dam forms a small lake, the surface of which is 88 feet above the normal water surface in the river immediately below the dam, and this makes it possible to divert by gravity directly from the lake into the Emmett south side canal. The Emmett north side canal, however, is too high for gravity diversion and the Black Canyon pumping plant serves to pump water from the lake into this canal.

This pumping plant contains two units, each consisting of a 48-inch, vertical, screw-type, centrifugal pump direct connected to a hydraulic turbine. Each unit receives water from the lake through a steel penstock 5 feet in diameter which branches a short distance from the unit into a 4-foot diameter pipe supplying water to the inlet side of the pump and a 3-foot diameter pipe connecting to the turbine inlet. The upper end of each penstock is provided with a trash rack and a 4.8 by 6-foot motor-operated slide gate which is controlled from the switchboard in the power plant. A 48-inch, motor-operated, needle-type valve is provided between each pump and the discharge pipe which serves both units. The

discharge pipe is 7 feet in diameter and connects with a reinforced concrete conduit of the same size built into the dam, which carries the water to the north end of the dam where it is delivered into the Emmett north side canal. A venturi meter in the discharge conduit indicates and records the amount of water pumped. The turbines operate under a head varying from 80 to 90 feet and the normal head on the pumps is 25 feet. The pumps have a combined capacity of 300 second-feet and about 1.6 second-feet of pumped water is delivered for each second-foot of power water discharged through the turbines.

The Black Canyon power plant has two generating units, each consisting of a 6,000-horsepower vertical shaft hydraulic turbine direct connected to a 5,000-kv-a. generator with direct connected exciter. Each turbine has a steel penstock 8 feet in diameter, the upper end of which is provided with trash rack and a 6.4 by 10-foot motor-operated slide gate which is controlled from the switchboard. Power is generated at 6,600 volts. An outdoor transformer station containing a 10,000-kv-a. bank of water-cooled transformers raises the voltage to 66,000 for transmission over a transmission line 3.75 miles in length, which connects the power plant with the Idaho Power Co.'s system at a point near Emmett. Through an interchange agreement with this company,

the power is transmitted over its lines to the pumping plant of the Gem irrigation district and the Idaho Power Co. receives all excess power not required by the district. The Gem district pays an annual charge for the power received from the Black Canyon plant which includes the actual cost of operation and maintenance plus depreciation on the power plant and transmission line plus interest on the investment in the power system at the rate of 5 per cent per year. The cost of power to the district under this arrangement is approximately \$42,000 per year, or about half of what it formerly was when power was being purchased from the local power company. The Gem district will eventually secure water by gravity from the Owyhee River and pumping from Snake River will then be eliminated. Power from the Black Canyon plant will then be available for pumping on the Payette division of the Boise project.

The switching equipment of this plant is a little out of the ordinary in that it is of the full automatic type. In case of an abnormal condition, such as a hot bearing, hot generator winding, failure of insulation of generator winding, overspeed, or excess voltage, the units will be automatically disconnected from the line and shut down. The operation of synchronizing the generators with each other or with the system of the Idaho Power Co. is performed automatically and in case of trouble on the transmission lines the oil circuit breaker on the outgoing circuit will try out the line three times at predetermined intervals and if the trouble remains on the line the breaker will then lock itself open and the plant will automatically shut down without attention on the part of the operator. This equipment has functioned very satisfactorily during the two years that it has been in service. The power and pumping plants are housed in the same building, which permits both to be operated by one operating organization consisting of a power-house foreman and three operators.

Close regulation of the flow in the river is essential as fluctuations of any magnitude interfere with the diversion of water into the various canals below the dam. The overflow section of the dam is provided with three automatic drum gates each 14.5 feet high and 64 feet long, which control the quantity of water passing over the dam so as to maintain the water surface of the lake at the desired elevation. An increase in the quantity of water flowing into the lake causes it to rise



Black Canyon dam, Boise project, Idaho

slightly and this changes the position of a float which in turn causes the drum gate to depress sufficiently to discharge the additional water. The operation is reversed if the quantity of water entering the lake decreases, causing the drum gate to rise so as to accommodate the lesser flow. One drum gate is provided with a remote control operated from the switchboard in the power plant, and gauges on the switchboard indicate the elevation of the water surface of the lake and the height of the gauge at the river gauging station located several hundred feet below the plant. By means of these gauges and the remote control of the drum gate above mentioned, the operator can adjust the position of the gate so as to maintain uniform flow in the river below the plant.

State Courts Suits Against U. S. Officers

The case of *Town of Casa Colorado Land Grant v. Pooler*, U. S. District Forester (N. M., 1927), 259 Pac. 629, is notable for its careful review of the decisions of the Federal courts in regard to suits against officers of the United States in their personal capacity. The defendant, as forest supervisor of the National Forest Service, was occupying certain land as a part of the Manzano National Forest, to which the plaintiff claimed title. Plaintiff brought suit to restrain the defendant from continuing to occupy the land, and alleged in its complaint that it owned the land and that defendant was denying plaintiff the use thereof, to the great damage of plaintiff. Defendant demurred on the ground that it appeared upon the face of the complaint that the defendant was in possession of the land only as the agent of the United States, and that the suit was one therefore against the United States, of which the court had no jurisdiction.

The court held that the demurrer admitted the wrongful possession, and hence that an injunction should issue. Being a mere agent is in itself no excuse for committing a wrong.

Whatever an animal has, so far as its inheritance is concerned, it gets from its parents. They get theirs from their parents, and so on back to the beginning.

Selection has brought about the improvement of the important present breeds of livestock over the stock from which they originated.

Washington Cities Can Not Exercise Police Powers Outside Boundaries

IN September, 1925, the city of Cle Elum, Wash., enacted an ordinance by which it purported to assume jurisdiction over Lake Cle Elum and to constitute boating, swimming, and fishing on the lake, offenses punishable by the city. The lake is outside the corporate limits of the city, lying about 6 miles northwest therefrom. The Federal Government has at this point constructed a reservoir for its Yakima reclamation project. In *Brown v. City of Cle Elum* (255 Pac. 961), Department 2 of the Supreme Court of Washington passed upon an injunction suit brought by Brown, who occupied a cottage on the shore of the lake, to restrain the city from enforcing the ordinance. The decision of the divisional court was in favor of the validity of the ordinance, but upon rehearing it was decided by the full court, in a case not yet printed, that the ordinance violated article 11, section 11 of the State constitution, which provides as follows: "Any county, city, town, or township may make and enforce within its limits, all such local police, sanitary, and other regulations as are not in conflict with general laws."

The city in enacting the ordinance followed the provisions of sections 9127 and 9473 of Remington's Compiled Statutes, assuming to give cities in the State of Washington authority to enact such ordinances. The ultimate holding of the supreme court was therefore to the effect that this provision of the State code violated the constitution.

The case is of considerable importance to the Bureau of Reclamation which holds all of the land around the lake, and is compelled to utilize the lake for the transportation of lumber cleared away in connection with the reservoir site. The court of its own motion requested the district counsel of the bureau to file brief as *amicus curiae*. In this brief the inter-related rights of the State and Federal Governments were discussed, but the court in its decision passed this matter over in silence, putting its decision upon the ground, as stated above, that the assumed jurisdiction of the city was not permitted by the constitution of the State.

Project Chief Clerk County Fair Winner

In 1926 E. R. Scheppelmann, chief clerk and fiscal agent on the Lower Yellowstone project, Montana-North Dakota, took a remarkable number of prizes at the Richland County Fair for vegetables raised in his garden at project headquarters in Savage, Mont. Last year he exhibited 28 different kinds of vegetables and 3 fruits, with the result that he took a sweepstake prize for the best and largest variety of vegetables produced in one garden. Just another indication of the real opportunities for good farmers on this project.



Chief Clerk Scheppelmann in his prize-winning garden, Lower Yellowstone project

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, will attend the annual meeting of the National Bureau of Economic Research in New York on February 6. Doctor Mead is a director at large of the bureau.

Floyd M. Watson has resigned as assistant clerk in the Denver office.

Miss Elisabeth von Hagen, stenographer on the Rio Grande project, has resigned to become secretary to L. M. Lawson, International Boundary Commissioner, with headquarters at El Paso.

Alfred R. Wilson, former secretary of the Strawberry Water Users' Association, Strawberry Valley project, Utah, and secretary of the Strawberry High Line Canal Co., died on January 24, 1928.

F. T. Crowe, construction superintendent with the Morrison-Knudsen Co., was a recent visitor on the Boise project

C. D. Greenfield, agricultural development agent of the Great Northern Railway, was a recent visitor on the Milk River project.

C. C. Wilburn, of Jerome, Idaho, has been chosen as the third member of the board of appraisers to appraise excess area and new lands on the Minidoka gravity extension unit. The other members are W. W. Johnston, representing the Bureau of Reclamation, and J. L. Driscoll, of Boise, representing the irrigation district.

Charles R. Pollock, supervisor of fisheries for the State of Washington, accompanied by the State superintendents of salmon and game fisheries, the Yakima County game commission, the game warden, and the superintendent of the State fish hatchery, called recently at the Yakima project office to discuss methods of preventing the loss of fish in irrigation canals.

J. L. Lytel, superintendent of the Yakima project, and B. E. Stoutemyer, district counsel, held a conference at Olympia, Wash., with the State supervisor of hydraulics and a representative of the attorney general's office relative to the adjudication of the waters of the Yakima River, and it was agreed that the State would proceed with the adjudication.

Recent visitors to the Kittitas division of the Yakima project included A. F. Stotler, district engineer, Northern Pacific Railway; Mr. Clements, superintendent

of bridges, Chicago, Milwaukee & St. Paul Railway; and Charles R. Pollock, State supervisor of fisheries.

T. A. Miller-Brownlie, who is interested in irrigation investigations in the Punjab, India, was a recent visitor on the Yuma project.

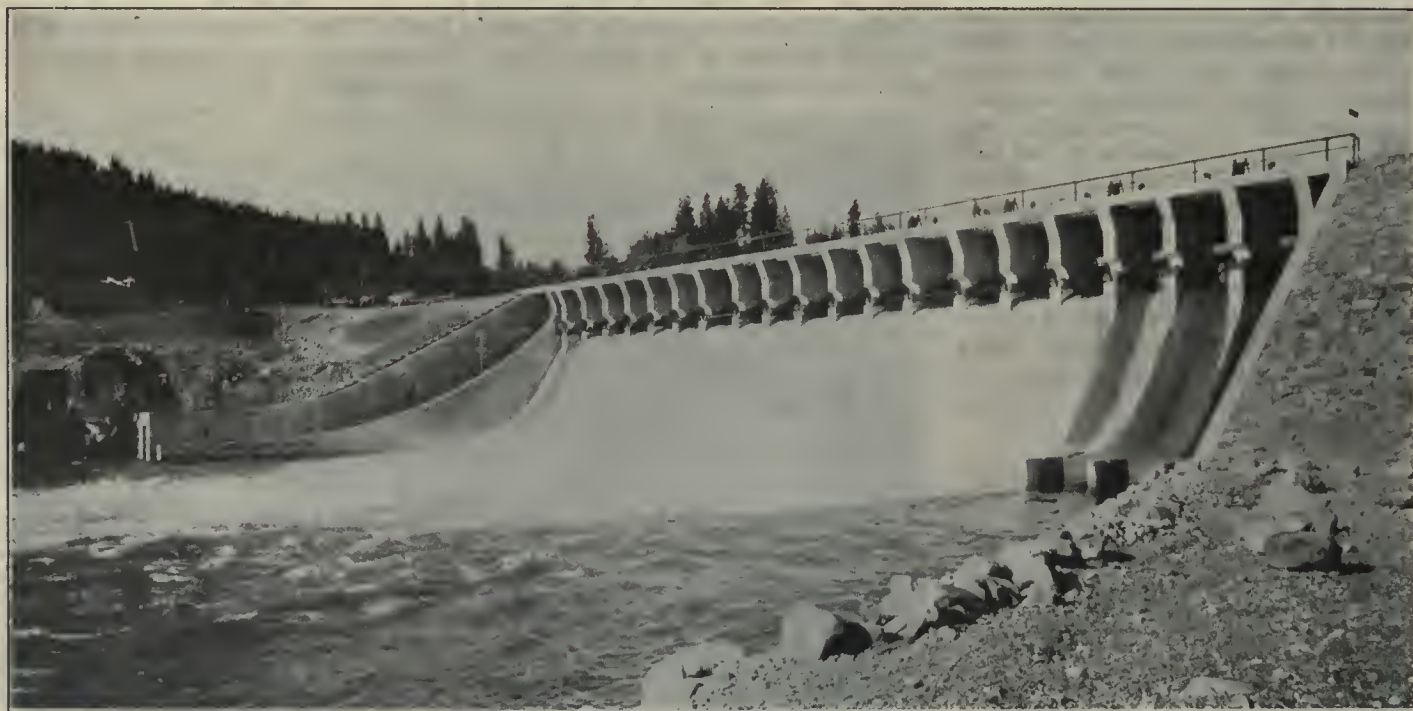
Frank F. Smith, engineer, and Oscar L. Rice, assistant engineer, have been transferred from the North Platte project to Echo Reservoir, Salt Lake Basin project.

J. P. Siebeneicher, chief clerk on the Huntley project, has been transferred to a similar position on the Belle Fourche project.

J. R. Iakisch, engineer on the Shoshone project, has assumed charge of drainage investigations on the Klamath project.

E. E. Lewis, water master on the Shoshone project, has resigned to accept the position of superintendent of the Huntley project.

L. C. Hill and Oro McDermith, consulting engineers, and S. O. Harper, general superintendent of construction, spent several days in the Washington office reviewing the reports on the Pecos River investigations.



Jackson Lake Dam, discharging 12,000 cubic feet of water per second

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Sieheneicher.....		Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....		B. E. Stoutemyer.....	Portland, Oreg.
Carlshad.....	Carlshad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chlesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....					
King Hill ³	King Hill, Idaho.....					
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	Erie W. Shepard.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weher.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....		B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....					
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....		E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Provo, Utah.....					
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Hermiston, Oreg.....					
Uncompahgre.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Vale.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yakima.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
Yuma.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....		J. R. Alexander.....	Montrose, Colo.
Kititas.....	Ellensburg, Wash.....	Walker R. Young ¹²	E. R. Mills.....		B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gihson Dam.....	Augusta, Mont.....	Ralph Lowry ¹²	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹²	C. B. Funk.....		R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Valley Water Users' Association on Dec. 1, 1926.

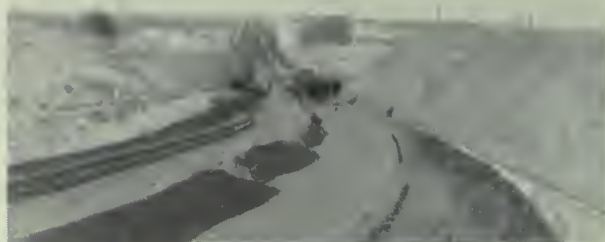
¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Cache la Poudre investigations.....	Denver, Colo.....	Thomas Hawthorne.....	Poudre Valley Water Conservation Association.
Middle Rio Grande.....	Albuquerque, N. Mex.....		Middle Rio Grande conservancy district.
Columbia Basin Project.....	Lind, Wash.....	B. E. Hayden.....	State of Washington.
Truckee River.....	Reno, Nev.....	A. N. Burch.....	
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Cle Elum storage.....	Yakima, Wash.....	P. J. Preston.....	
Payette storage.....	Boise, Idaho.....	R. J. Newell.....	
Southern investigations.....	Washington, D. C.....	George C. Kreutzer and C. A. Bissell.....	Southern States.



ECONOMIC DEVELOPMENT ON THE BELLE FOURCHE PROJECT, SOUTH DAKOTA

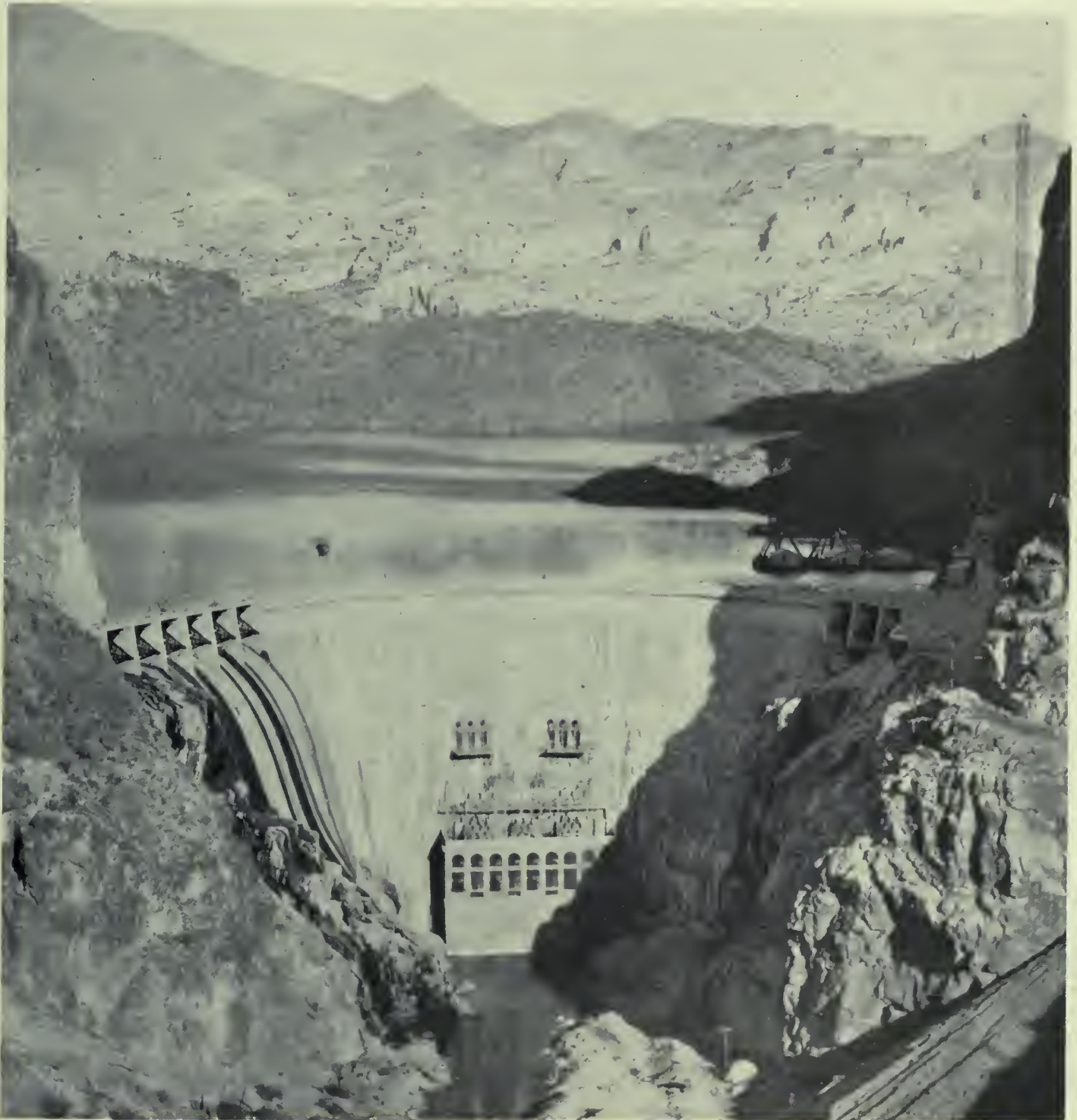
Left to right: One of the publicity signs. Graveling Federal Highway between Belle Fourche and Newell. One of the four pickle-salting stations. New Utah Idaho Co. sugar refinery at Belle Fourche. New power beet dump. Building the Vale branch of the Chicago & North Western Railway. A farm home. Young dairy herd

NEW RECLAMATION ERA

VOL. 19

MARCH, 1928

NO. 3



HORSE MESA DAM, SALT RIVER PROJECT, ARIZONA



ECONOMY in Federal operations is here to stay. True economy means the discouragement of unnecessary expenditures. It carries no thought of unwise, unscientific limitation. Rather, it makes ample provision for things that must be done. Pressure for retrenchment, insistence upon wiser spending, have furnished capital to meet our new demands without expansion of our expenditure program. We can not absorb by economy all of our prospective new requirements. If we absorb as much as possible, we have realized the true meaning of economy. By saving money where money can properly be saved, we have developed what is more properly termed a constructive economy program in our Federal service. It is not a policy of negation. It calls for positive action. It proceeds in accordance with the dictates of common sense and the principles of sound business. It is provident. It looks ahead. It undertakes to make plans for the needs of to-morrow.

From the address by President Coolidge at the Fourteenth Meeting of the Business Organization of the Government, January 30, 1928

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.
Price, to others than project water users, 75 cents a year

HUBERT WORK
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

MARCH, 1928

No. 3

Interesting High Lights on the Federal Reclamation Projects

THE Chicago & North Western Railway has begun a series of newspaper advertisements calling attention to the Black Hills region and the agricultural opportunities in the adjacent irrigated districts, including the Belle Fourche project. These displays will appear weekly in a number of mid-west dailies and will continue for about three months.

FIVE hundred field boxes of citrus fruit were picked from the syndicate holdings on the Yuma Mesa during January, bringing the total to the end of the month to 4,750 boxes on unit B. One 10-acre unit is being leveled and will be planted to trees this spring, and another 10-acre unit will be used to grow nursery stock. Present indications are that from 40 to 50 acres will be planted to citrus trees before hot weather.

EXCELLENT cooperation in the settlement work on the Milk River project has been received from representatives of the Malta irrigation district. Circular letters were sent out by the secretary of the district to approximately 1,500 inquirers as a follow-up to recent advertising of the project by the local press. A number of very favorable replies were received from prospective settlers who are planning to visit the project this spring.

THE execution of beet production contracts on the Milk River project has progressed satisfactorily. At the end of January an acreage had been contracted considerably larger than that planted last year, with a large portion of the district still to be canvassed.

ONE of the largest items of wealth shown on the census returns from the Newlands project is dairy stock, with a total of all classes of 9,357 head, valued at \$710,626. This is an increase of 4,016 head and of \$183,656 in value over 1926.

FIFTY-FIVE cars of oranges were shipped from the Orland project during the past season, of which 47 cars were packed and marketed by the Orland Orange Growers' Association. In addition to a large yield, highly remunerative prices were received. The final crop census report for the project orange groves show a total production of 17,500 commercial pack boxes from 296 acres of trees under irrigation, producing oranges valued at \$70,000, or an average of \$236.50 per acre.

RECENT statistics of the 1927 operations of the two Orland project creameries show an increase of 22 per cent in the amount of butter produced over 1926. The total amount made was 1,314,000 pounds, the butterfat for which was largely produced by the dairy herds of the project, numbering 3,243 cows.

THE Guaranty Building & Loan Association of San Jose has established a local agency on the Orland project. The company contemplates a loan service for home buildings within the town of Orland and the immediate adjacent residence district, as well as an investment service.

A SEMICOOPERATIVE company has been formed at Sunnyside, Yakima project, to encourage and partially finance the growing of mint on the Sunnyside division. Encouraging results were obtained by growers of this crop last year, but the work is still in the experimental stage.

A COMMITTEE of sugar-beet growers on the Minidoka project met recently with the management of the Amalgamated Sugar Co. at Ogden to urge operation of the Paul factory next fall. It was estimated that under favorable conditions 6,000 acres of beets could be secured for the Paul factory and 4,000 acres for the Burley factory.

PRACTICALLY all the spring wool crop on the Uncompahgre project has been contracted for at a good price ranging around 32 cents a pound.

FAVORABLE conditions and a good crop gave turkey growers on the Uncompahgre project during the past year an average of approximately 41 cents a pound for No. 1 grade turkeys. The shipments were made in boxes manufactured by the Montrose Box Co. located in Montrose.

IT HAS been announced by the Kraft Cheese Co. that in addition to the factory which they started recently in Montrose, Uncompahgre project, another factory will be opened in the near future in Delta. This development will help to increase the dairy industry in the lower end of the valley.

THE annual poultry show of the Western Slope Colorado Poultry Association was held at Delta, Uncompahgre project, during the early part of January. There were 66 exhibitors. Some of the turkeys on display were valued at as high as \$250. Poultry authorities state that this show was the best ever held on the western slope, the equal of any ever held in the State of Colorado, and would rank with the 10 best shows in the United States.

THE Associated Seed Growers (Inc.) are making contracts for the growing of seed peas and beans on the Shoshone project for the coming season.

ARRANGEMENTS are being made by local banks on the Lower Yellowstone project to finance farmers for the purchase of pure-bred dairy stock. Tentative plans call for two-year loans at 8 per cent, one-half of the loan to be retired at the end of the first year.

Reclamation Settlement and Development Conference

Held in Washington, D. C., February 14 and 15, 1928

FAR-REACHING and beneficial results to reclamation and the settlement and development of the Federal irrigation projects are foreshadowed by the settlement and development conference held in the auditorium of the Interior Department on February 14 and 15, 1928, announcement of which was carried in the February issue of the *NEW RECLAMATION ERA*.

The conference was attended by a large number of influential and well-informed men, representing a cross section of individuals and organizations interested in the problems of Federal reclamation and in safeguarding the investment of the Government. Among these were Senators and Congressmen from the Western States, State engineers, members of chambers of commerce, sugar company officials, and representatives of the water users and of the settlement and development organizations of the transcontinental railroads. The problems under discussion offered a field for wide diversity of opinion, yet there was an amazing unanimity in the conclusions reached by the delegates after full and free discussion.

The conference was called to order at 9.45 a. m. on February 14, with Hon. E. C. Finney, First Assistant Secretary of the Interior, presiding. The conference was honored by the presence of Hon. Hubert Work, Secretary of the Interior, who welcomed the delegates in a brief but inspiring address. The Secretary touched on the history of Federal reclamation, referred to its bright outlook for the future, and called attention to the fact that it is now on a paying and business basis.

Dr. Elwood Mead, Commissioner of Reclamation, then discussed the purpose of the conference. Doctor Mead stated that he thought it appropriate to first call attention to the recent achievements of the water users, in the matter of repayments, the collections for construction in 1927 being \$1,000,000 greater than in 1926. In 1927 the value of crops grown on the projects was \$18,000,000 greater than in the preceding year. Doctor Mead said that attention should be given by the conference to the question whether reclamation should include financial aid to the settlers, preparation of the land, and the building of houses before actual settlement.

Hon. Addison T. Smith, of Idaho, Member of the House of Representatives, gave an exceedingly interesting and instructive talk on the public-land policy. He referred to the unwise action of open-

ing public land to entry without regard to its possibility of profitable cultivation and without adequate information being given to the settlers. There was, however, a distinct advance made under the reclamation act, although even here some projects were unwisely selected. He stressed the fact that the reclamation of arid lands is not only a benefit to the individual farmer who develops a home and to the adjacent towns but to all parts of the country which ship goods to these projects.

Hon. John B. Kendrick, United States Senator from Wyoming, then addressed the conference, stating that in the commonwealth building of the West the development of irrigation projects is of the utmost benefit. Financial aid to settlers, he said, is the next step to be taken to safeguard the investment of the Government and give the settlers an opportunity to develop a going concern before their original meager capital has been lost. Reclamation, he said, is the most important work the Government is doing in the arid States.

Mr. R. E. Kelly, manager of development of the Southern Pacific Railway, spoke on the subject of the relation of the railroads to reclamation, pointing out that a reclamation project lacking railroad facilities to carry its crops to market would be hard put to exist. He referred to the railroad development of the Southern Pacific on the southwestern projects, and stated that more and more attention would be given to what can be done by the railroad in settling the proper people on irrigated land.

Mr. John W. Haw, director of the department of agricultural development of the Northern Pacific Railway, urged aided and directed settlement as a natural and proper function of the Government, stating, however, that we should start on a small scale and feel our way along in order to develop the best possible policy.

Mr. W. H. Russell, colonization agent of the Lethbridge northern irrigation district, Alberta, Canada, concluded the morning session with an interesting description of how the colonization department of his district is assisting settlers of small means. Actual cash is not advanced to these settlers, but they are furnished with the necessary supplies and materials, safeguarded by the principle that nothing is done for a man that he can do himself. He concluded his remarks with a number of examples of the value of financial assistance to settlers coming to the project with entirely in-

adequate capital, but who are now self-supporting home owners.

The conference adjourned for lunch, convening at 2 p. m. with Mr. Richard R. Lyman, of Salt Lake City, presiding.

The first speaker was Dr. F. B. Linfield, dean and director of the Montana State College of Agriculture, who described the agricultural situation in Montana over a succession of years. He stated that all the projects are "sick," the main trouble being that on all a portion of the land is not producing, caused by lack of settlers and poor farming. He called attention to the heavy expense of the farmer in preparing his land and in making it habitable in order to make it a going concern. Some agency must be created, he said, to finance these costs.

Mr. W. B. Buchholz, secretary of the Belle Fourche irrigation district, Belle Fourche project, South Dakota, spoke on the subject of the settlement needs of the projects, referring to their slogan of "A farm on every 80 acres." He urged especially the cooperation of all agencies, chambers of commerce, railroads, State agricultural departments, and others to aid in solving these settlement problems. More and better buildings are a necessity, he said, if potential landowners are to be interested in undeveloped land on an irrigation project.

THE GROUP MEETINGS

The delegates to the conference then divided into three groups to discuss particular problems of settlement and development of reclamation projects.

Group No. 1 considered projects where irrigation works are completed, but lacking settlement and farm development. These projects included Riverton, Belle Fourche, Lower Yellowstone, Milk River, Willwood, and Uncompahgre. The round-table discussion was led by Mr. George C. Kreutzer, director of reclamation economics.

Group No. 2 considered projects where irrigation works are now under construction and where there is a need now for preparing plans for settlement and development. These projects included Kittitas, Vale, Owyhee, Payette, Minidoka Gravity Extension, and Greenfields. The round-table discussion was led by Dr. Hugh A. Brown, assistant director of reclamation economics.

Group No. 3 considered the costs, possibilities, and needs of projects under investigation. These included Columbia Basin, Upper and Lower Colorado Basins,

Pecos Valley, Umatilla Rapids, Heart Mountain, Casper-Alcova, Saratoga, Deschutes, Minidoka Pumping, Kennewick, Yakima-Benton, Baker, Stanfield, and Westland irrigation districts. The round-table discussion was led by Mr. P. W. Dent, assistant commissioner of reclamation.

These groups were in session during the afternoon of February 14 and the morning of February 15. At 2 p. m. on the 15th the conference again met in general session for the submission of the group reports and resolutions.

REPORT OF GROUP NO. 1

The report of Group No. 1 was submitted by Mr. W. B. Buchholz, as follows:

This group composed of about 20 members of the conference met in the auditorium of the Department of the Interior at 3.15 p. m., February 14, 1928, to consider problems of settlement and farm development of projects having irrigation works completed but lacking settlement. These projects include Riverton, Belle Fourche, Lower Yellowstone, Milk River, Willwood, and Uncompahgre.

On Belle Fourche, Lower Yellowstone, Willwood, and Riverton active settlement work has been carried on during the past year. As an illustration, on the Belle Fourche project options were taken on 95 unoccupied farms at prices fixed by independent appraisal. The terms of purchase were 20 years and the interest was fixed at 6 per cent. The land was good, the water supply ample and cheap. Seventeen farms have been sold. All farms having good buildings were either sold or leased to good tenants. The unoccupied farms remain untaken, yet the soil is good and ample water is available for irrigation. Settlers did not have the means to buy these unimproved farms and provide the necessary improvements. Furthermore, the owners were unable to finance this development. No local agency can supply this credit. Yet on Willwood, Belle Fourche, Lower Yellowstone, Milk River, and Riverton the Government has expended \$18,771,000 to construct works to irrigate 283,070 acres of land, of which only 78,640 acres were irrigated in 1926. About 1,400 settlers are needed to cultivate the unirrigated and unoccupied farms on these projects. Results similar to those stated for Belle Fourche were secured for Lower Yellowstone.

It was the opinion of this group that the Government should provide this need to complete the settlement of these projects by providing advances and thus insure their solvency.

It was moved by Mr. Buchholz and seconded by Mr. Kuska that it is the sense

of this meeting that Senator Kendrick's bill, S. 2829, and the companion bills in the House, introduced by Hon. William Williamson and Hon. Charles Winter, providing for aided and directed settlement on Federal irrigation projects should be enacted into law at this session of Congress. This was unanimously carried.

Options on farms for sale in favor of the Government on the Belle Fourche and Lower Yellowstone projects expire on December 31, 1928, and on the Orland project on June 30, 1929. It was agreed on motion made and carried that land settlement work should be continued on these projects and the options be renewed for a period of two years after their date of expiration.

On the projects above mentioned more industries and cooperative marketing should be encouraged. It was agreed that this could best be stimulated by placing on such projects project service men, who would assist in settlement and farm development and in the formation of cooperative marketing associations, and further that the cooperation of the United States Department of Agriculture, State agricultural colleges, State agricultural departments, and all other agencies be secured in bringing about these desirable results.

It was the sense of the meeting that in order to secure more and better livestock on projects steps should be taken locally to secure the benefits of the Federal intermediate credit act.

The following action was taken regarding the disposition of temporarily and permanently unproductive public lands on reclamation projects:

It was duly moved and seconded that the bill H. R. 9958, introduced in the House by Hon. Scott Leavitt, to authorize the disposal of public lands classified as temporarily or permanently unproductive on Federal irrigation projects, be indorsed and its passage is urged. This bill provides for the sale of class 5 and class 6 lands in public ownership to resident entrymen and resident landowners on Federal irrigation projects at prices fixed by independent appraisal and in areas not to exceed 160 acres. This would put these lands in the hands of actual settlers for grazing or other purposes and in this way may become reclaimed and credit eventually accrue to the project and the United States Government.

On a number of Federal projects there is a large acreage of lands for which general homestead proof has been made for residence, cultivation, and improvements. This land is salable and used as security for loans on a par with neighboring patented lands. However, such lands are not subject to assessment for general taxes for school, county, and State pur-

poses, for the lack of what is called reclamation proof, this proof simply being a report of the irrigation which has been done. Such lands, being freed from general taxes, throw a heavy burden upon the adjoining patented lands. For years there has been a request from projects that irrigated homesteads be taxed the same as nonirrigable lands just as soon as general homestead proof has been made for residence, cultivation, and improvements. Such is the purpose of House bill 475, introduced by Congressman Winter from Wyoming. These lands heretofore have fully shared in the benefits of community development but have escaped general taxes. A motion was duly made and seconded that the bill be indorsed and its passage urged.

REPORT OF GROUP NO. 2

The report of Group No. 2 was submitted by Mr. J. M. Hughes, land commissioner of the Northern Pacific Railway Co., as follows:

The discussion of Group 2 was limited to the problems presented on the six new projects under construction, namely, Kittitas, Owyhee, Vale, Payette, Minidoka Extension, and Greenfields. These six projects represent an ultimate investment by the Government of \$50,600,000, a total area of 437,000 acres, and an area of 300,000 acres requiring some 3,700 settlers. To put these projects on a paying basis there must also be expended \$27,650,000 as a minimum for such items as advertising and placing settlers on the land, clearing and preparing the land for irrigation, erecting houses, fences, and necessary farm buildings, cultivation and living expenses the first year, and the purchase by settlers of land privately owned.

The difficulty of obtaining qualified settlers is well known. The records of the Bureau of Reclamation show that 45 per cent of the prospective settlers furnishing information about their available capital have less than \$2,500. Only 7 per cent have \$5,000 or over. It would seem the part of wisdom, therefore, to adopt a conservative construction program on these newer projects, so far as practicable in the interests of economy and efficiency of construction.

Analysis of the situation on the Kittitas and Vale projects, however, leads to the conclusion that construction should proceed to the completion of the projects without intermission. The reasons for this view are as follows:

(a) The situation on the Kittitas project is such that the lands requiring settlement lie at the extreme end of the project and can not, of course, be settled until all construction work is done. Lands farther up are partially irrigated

from hillside streams and are largely settled. There would therefore be no settlement problem in the upper sections of the project which would not be taken care of readily by local requirement.

(b) The Vale project comprises altogether only about 25,000 acres of irrigable land. The construction of the works will require sufficient time to permit the settlement of the smaller districts near the upper end, so that the completion of the project need not be in any way delayed. The main settlement problem on this project will begin after the major portion of the works is completed.

With reference to the Owyhee project, which comprises about 41,000 acres of lands under pumping plants and has altogether about 80,000 acres of unoccupied lands requiring settlement when the project works are completed, inasmuch as the plants under the Gem district are now being furnished with cheap power from the Black Canyon power plant which in our opinion permits irrigation at very little, if any, more expense than will be necessary when water is furnished from the Owyhee project, it is believed that this unit should not be developed until other sections of the project are fully settled. It is further believed that the lands now under pumping plants on the lower end of the project, comprising approximately 8,000 acres, will suffer no hardship on account of delay, if furnished Government power at reasonable rates for carrying on their operations as at present. It is therefore recommended that the canal systems designed for the Gem irrigation district and for the country north of the Malheur River should not be constructed until satisfactory settlement has been effected on the areas known as the Nyssa Bench and the Kingman Colony district. This recommendation is based on the assumption that power can be furnished at reasonable rates either from Black Canyon power plant or from a power plant to be constructed at the Owyhee Dam to all pumping plants now in operation under the project. Such a plan would permit the settlement and development of two of the principal areas of the project before extending the construction works to cover areas for which it will be harder to secure settlers. It would also obviate the necessity of keeping up a long and expensive canal system before settlement had developed to the point where operation and maintenance costs could be met by the settlers.

As a matter of policy it is believed that reclamation projects should be developed in economical units which should be settled and developed before construction proceeds to the completion of the project.

It is believed that the present regulations should be continued without modification, providing for the selection of settlers on the basis of approved qualifications of industry, experience, character, and capital. It has been suggested that the requirement of \$2,000 in cash or its equivalent in livestock, farming implements, or other assets of equal value, shuts out many potentially worthy settlers. In view of the fact, however, that the development of an irrigated farm necessitates the expenditure of \$5,000 to \$7,000, of which about \$4,000 should be expended in the first year if the best results are to be obtained, we believe that \$2,000 is the minimum that should be required under present conditions. On the other hand, to increase this requirement would undoubtedly result in the operation of the law of diminishing returns, and fewer settlers than at present would be available.

We are in favor of the employment of a project adviser, employed by and under the jurisdiction of the Bureau of Reclamation, on each new project, as soon as a sufficient number of settlers have taken up new land to make his services economically profitable, and to continue as long as it may appear necessary. The cost of this work should, wherever possible, be included by contract in the construction cost, to be repaid as a part of construction. Steps should be taken to make this service a part of the present contracts, or included in supplemental contracts, with the irrigation districts. There can be no question of the value of such advisers if their whole time is devoted to the settler in his farming and building operations, in helping him in planning crop programs, in forming cooperative organizations for buying and selling, and in general in helping to build up the agricultural, economic, and social life of the community.

The problem of land in excess and nonresident ownership is common to practically all of these projects. The owners of much of this land have definitely stated, in reply to questionnaires, that they have no intention of developing it themselves. In those cases where the present owners are willing to dispose of such land at the appraised price, it is believed that authority should be granted by Congress for the purchase of such land by the Government for disposal in promoting the development and settlement of the project.

The acquisition and disposal of such land by the Government would aid in the coordination of construction, settlement, and development work to a much greater degree than is possible at present. Farm units could be laid out in conformity with topography, with a material saving in

both construction and operation and maintenance costs, in the location of laterals, and in the reduction in the number of drops, turnouts, and canal riders.

It is believed that the preparation of the land before settlement, including clearing, leveling, the development of stock and domestic water supply, the erection of dwellings and other farm buildings, and other permanent improvements, should be recognized in this country, as they are in many foreign countries, as integral parts of the construction of a project. Closely associated with these factors is the creation of some source of credit for the settler in the early years of development. At present this is not available from any practical source. The Federal land bank loans only on patented, improved land. Local banks loan only for inadequate periods at high interest rates. Neither affords a practical source of credit for the settler of small means—the man by whom these projects must be settled under present economic conditions. The bills (S. 2829, H. R. 9956, and H. R. 10491) to provide for aided and directed settlement on Federal reclamation projects adequately answer these needs, and we urge their enactment into law without delay.

REPORT OF GROUP NO. 3

No written report was submitted by this group. Mr. J. B. Lamson, agricultural development agent of the Chicago, Burlington & Quincy Railway Co., stated that the discussion of this group had been limited largely to consideration of the bills providing for aided and directed settlement and that their conclusions were incorporated in the resolutions to be submitted to the conference.

THE RESOLUTIONS

Each group, at the conclusion of its deliberations, drafted a number of resolutions for consideration by the conference. These resolutions were submitted to the resolutions committee comprising Mr. Buchholz, representing Group No. 1; Mr. Hughes, representing Group No. 2; and Mr. Lamson, representing Group No. 3. The resolutions were correlated by the resolutions committee and submitted to the conference, as follows, by the chairman of the committee, Mr. Hughes:

Whereas the new projects now under construction by the Bureau of Reclamation, namely, Kittitas, Owyhee, Vale, Payette, Minidoka Gravity, and Greenfields, involve an ultimate investment by the Government of \$50,600,000, an area requiring settlement of 300,000 acres, and the need for 3,700 settlers; and

Whereas in order to make these farms going concerns there is involved an additional minimum expenditure of \$27,650,000 for advertising and placing settlers on the land; clearing and preparing the land for irrigation; erecting houses, fences, and other necessary farm buildings; farm equipment; cultivation and living expenses for the first year; and the purchase by settlers of land in private ownership; and

Whereas the solvency of these new projects depends on their prompt settlement and development; and

Whereas the Riverton, Belle Fourche, Lower Yellowstone, and Milk River projects and the Willwood-Division of the Shoshone project involve an investment by the Government of approximately \$19,000,000, which provide irrigation facilities for 238,070 acres, of which only 78,640 acres were irrigated in 1926; and

Whereas to properly cultivate the land on these projects require about 1,400 settlers upon which depend the return of the Government's investment, and whereas settlement work has been carried on on these projects by the Bureau of Reclamation, railroads and other agencies; and

Whereas settlers have been secured for farms upon which there are satisfactory farm buildings but the undeveloped farms remain untaken; and

Whereas no source of private funds are available to provide such improvements on public land or unoccupied privately owned land: Therefore be it

Resolved, That it is the sense of this conference that the reclamation act should be amended to provide for the use of the reclamation fund in effecting such improvements on privately owned land for sale under proper safeguards and on the public land, and that the repayment for such advances for improvements be made over a long term of years at a low rate of interest;

That indorsement is given to the provisions of bills S. 2829, H. R. 9956, and H. R. 10491 providing for aided and directed settlement, the enactment of which and the appropriation of the funds requested therein would enable the Bureau of Reclamation to demonstrate on a small scale the efficacy in this country of legislation which for many years has been part of the reclamation and settlement laws of numerous foreign nations having similar problems, it being the belief that such aid in settlement will increase the number of farm owners on projects and lessen the evil of tenancy;

That the policy is approved of selecting settlers on the basis of approved qualifications of industry, experience, character, and capital, and that no change should be made in the present capital requirement of \$2,000;

That project service men should be employed on all new projects to help the settlers in planning agricultural operations and buildings, forming cooperative organizations and marketing their products; such services to continue only so long as they may appear necessary, the cost of such service to be repayable as a part of the construction cost under supplemental contracts with the irrigation districts;

That the settlement activities of all available agencies including the Federal Government, States, railroads, chambers of commerce, and other interested organizations, be coordinated with a view to attracting more and better qualified settlers;

That so far as practicable the land on the new projects should be subdivided into farm units on the basis of topography.

That construction work on the Kittitas, Vale, and Owyhee projects should be pushed to completion, following a construction program based on economy and efficiency; but that a unit construction program is consistent with economy and efficiency of construction and of settlement and development;

That in the case of private land in excess and nonresident ownership within the limits of a project, which will not be developed or cultivated by the owners themselves, and which can be acquired with the consent of the owners at the appraised value, authority should be granted by Congress for its purchase, subdivision and disposal by the Government in promoting the development and settlement of the project.

Whereas on several Federal irrigation projects there is a considerable body of land for which final proof has been made for residence, cultivation, and improvements but for which reclamation proof has not yet been made; and

Whereas such lands enjoy all of the benefits of community development and all of the protection and privileges of the State and local governments; and

Whereas such lands can be readily sold and used as security for loans; and

Whereas such lands can not be taxed for the support of schools or any other State and county purpose; and

Whereas such policy of not assessing the lands throws a heavy and unjust burden upon the neighboring lands which have come to patent; Therefore be it

Resolved, That we approve the principle of assessing irrigation homesteads the same as nonirrigation homesteads immediately after final proof has been made thereon for residence, cultivation, and improvements, even though the reclamation proof has not been offered. Be it further

Resolved, That we approve House bill 475, introduced by Congressman Winter, which covers this policy, and we petition for the enactment of this measure pending in Congress.

Whereas on a number of existing projects a considerable area of land has been classified as permanently unproductive and temporarily unproductive (class 6 and class 5); and

Whereas a large area of this land has been returned to the Government and is at present idle; and

Whereas the homestead and reclamation laws do not provide for effectively disposing of said lands; and

Whereas said lands are required by resident entrymen and resident owners for pasture purposes and for reclamation by drainage or irrigation;

Resolved, That this conference indorses and urges the passage of H. R. 9958, which provides for sale of said class 5 and class 6 lands by the Secretary of the Interior to resident entrymen and resident owners on the several projects.

Whereas the object of the Purnell Act is to make economic surveys in the various States, we suggest that the United States Department of Agriculture, colleges of agriculture, or other agencies having the administration and direction of the work and fund, cooperate with the Bureau of Reclamation in making economic surveys of each of the reclamation projects now in the process of development or about to be opened for settlement, the object being to get information to the settler or the intending settler which will show him the crops or products that can economically be produced in the particular project. These economic surveys can be of great help to the respective communities in forming a basis upon which credit organizations can be founded and proper organization for cooperative marketing and production on a commodity basis, and also be a basis from which successful industries can be established upon the various projects or their immediate vicinity.

Whereas many naturalized American citizens have become citizens of Canada, some of them for the purpose of acquiring land and some to enter the World War prior to the participation of this country; and whereas many of such former American citizens now desire to return to this country for the purpose of establishing homes on irrigation projects but find themselves barred except under the quota of the country of their birth; and whereas this constitutes a serious loss to the irrigation projects of this country greatly in need of such worthy settlers.

Resolved, That we urge upon Congress the importance of amending our immigra-

tion laws to permit the reentry of all former naturalized American citizens now residing in Canada or Mexico with the same freedom as it now extended to native-born citizens of those countries. Be it further

Resolved, That a copy of this resolution be sent to the Senate and House Immigration Committees. Be it finally

Resolved, That we are deeply appreciative of the sympathetic and businesslike administration of Federal reclamation as found in the policies of Secretary Work, Commissioner Mead, and many acts of Congress.

All resolutions were adopted unanimously as submitted. Doctor Mead then introduced Col. John H. Carroll, who summed up the problems and aims of the conference and voiced his whole-hearted belief in the future of reclamation. Motion pictures were then shown of settlement activities and settlement and development needs of the projects, followed by the adjournment of the conference.

On February 16 a number of the delegates attended a hearing before the House Committee on Irrigation and Reclamation to advocate the adoption of legislation providing for aided and directed settlement on the Federal reclamation projects.

THE DELEGATES

The delegates attending the conference were as follows:

Baker, Charles H., C. B. & Q. and N. P. Ry., Washington, D. C.
 Batch, Otto C., associate reclamation economist, Newell, S. Dak.
 Benson, E. F., agricultural development agent, N. P. Ry., Seattle, Wash.
 Brown, Hugh A., assistant director of reclamation economics, Bureau of Reclamation.
 Buchholz, W. D., secretary, Belle Fourche irrigation district, Newell, S. Dak.
 Byerly, H. W., general immigration agent, N. P. Ry., St. Paul, Minn.
 Cahill, T. Joe, executive manager, department of commerce and industry, Cheyenne, Wyo.
 Carey, C. C., engineer and farmer, Minneapolis, Minn.
 Carroll, J. H., C. B. & Q. and N. P. Ry., Washington, D. C.
 Childers, Chas. L., Rep. Arr. Dist. Association of California El Centro, Calif.
 Comstock, H. D., superintendent, Riverton project, Riverton, Wyo.
 Cowgill, Ralph P., Oregon Reclamation Congress, Medford, Oreg.
 Dale, William P., president, Uncompahgre Valley Water Users' Association, Delta, Colo.
 Deeds, J. F., Chief, Agricultural Division, United States Geological Survey, Washington, D. C.
 Dent, Porter W., Assistant Commissioner, Bureau of Reclamation.
 Engle, Chas., Bureau of Indian Affairs, Washington, D. C.
 Fly, Col. B. F., Yuma, Ariz.
 Flynn, Roh't., director of district No. 2, Fairview, Mont.
 Goodner, Ivan E., consulting engineer, Los Angeles, Calif.
 Goodwin, F. M., Mills Building, Washington, D. C.

Guy, David J., United States Chamber of Commerce, Washington, D. C.
 Hackney, E. C., president, irrigation board, Huntley, Mont.
 Haw, J. W., director, department of agricultural development, N. P. Ry., St. Paul, Minn.
 Hayden, B. E., reclamation economist, Bureau of Reclamation, Denver, Colo.
 Hughes, J. M., land commissioner, N. P. Ry., St. Paul, Minn.
 Hunter, H. F., C. B. & St. P. Ry., 816 Union Station, Chicago, Ill.
 Ide, W. G., manager, Oregon State Chamber of Commerce, Portland, Oreg.
 James, Delos L., 1615 H Street NW., Washington, D. C.
 Johnson, H. H., superintendent, Milk River project, Malta, Mont.
 Kelley, John E., Shelley, Idaho.
 Kelly, R. E., manager of development, Southern Pacific Ry. Co., 65 Market Street, San Francisco, Calif.
 Kendrick, John B., United States Senator, Wyoming.
 Kerr, H. C., Carlshad, N. Mex.
 Kreutzer, Geo. C., director of reclamation economics, Bureau of Reclamation.
 Kuska, Val, colonization agent, C. B. & Q. R. R., Omaha, Nebr.
 Kyle, James W., farmer, Stanfield, Oreg.
 Lamson, J. B., agricultural development agent, C. B. & Q. R. R., 547 West Jackson Boulevard, Chicago.
 Linfield, Dr. F. B., dean and director, Montana State College of Agriculture.
 Leedy, E. C., general agricultural development agent, Great Northern Railway, St. Paul, Minn.
 Lyman, Richard R., civil engineer, Salt Lake City, Utah.
 McCluskey, H. S., member, Colorado River Commission of Arizona, State Capitol, Phoenix, Ariz.
 Maddock, Thomas, engineer, 306 East McDowell Street, Phoenix, Ariz.
 Mason, J. Rupert, San Francisco, Calif.
 Mead, Dr. Elwood, Commissioner, Bureau of Reclamation, Washington, D. C.
 Merrill, M. C., editor, chief of publications, United States Department of Agriculture, Washington, D. C.

Mirtoff, Prof. J. A., Director, Russian Bureau of Agricultural Information, 26 Cortlandt St., New York, N. Y.
 Mitchell, L. H., superintendent, Shoshone project, Powell, Wyo.
 Morgan, Frank T., secretary, Owyhee irrigation district, Nyssa, Oreg.
 Nielsen, H. A., president, Idaho irrigation district, Shelley, Idaho.
 Ohso, J. G., vice-president and treasurer, Amtorg Trading Corporation, 165 Broadway, New York, N. Y.
 Oppegaard, O. M., president, Lower Yellowstone irrigation district No. 1, Savage, Mont.
 Plummer, G. H., western land agent, Northern Pacific Ry., Seattle, Wash.
 Pound, Earl C., president, Imperial irrigation district, Brawley, Calif.
 Preston, Porter J., superintendent, Yakima project, Yakima, Wash.
 Putnam, W. R., Idaho Power Co., Boise, Idaho.
 Rodey, P. C., attorney, Albuquerque, N. Mex.
 Rose, Mark, director, Imperial irrigation district, El Centro, Calif.
 Russell, W. F., colonization agent, Lethbridge northern irrigation district, Lethbridge, Alberta, Canada.
 Sands, W. B., Chinook, Mont.
 Sanfor, Geo. O., superintendent, Sun River project, Fairfield, Mont.
 Schnurr, Miss Mae A., secretary to Commissioner, Bureau of Reclamation, Washington, D. C.
 Seagraves, C. L., general colonization agent, Santa Fe R. R., 900 Railway Exchange, Chicago, Ill.
 Shepherd, R. E., general manager, North Side Canal Co., Jerome, Idaho.
 Smith, Addison T., United States Representative, Idaho, Washington, D. C.
 Smith, R. A., supervisor of agriculture, Union Pacific system, Omaha, Nebr.
 West, Gordon R., reclamation engineer, Missouri Pacific Lines, St. Louis, Mo.
 Westervelt, E. M., land and industrial commissioner, C. B. & Q. R. R. Co., Lincoln, Nebr.
 Whiting, John A., State engineer, Cheyenne, Wyo.
 Work, Dr. Hubert, Secretary of the Interior, Washington, D. C.

Aided and Directed Settlement on the Projects

SIMILAR bills (S. 2829, H. R. 9956, and H. R. 10491) have been introduced in the United States Senate and House of Representatives, respectively, by Senator John B. Kendrick and Representatives Charles E. Winter, of Wyoming, and William Williamson, of South Dakota, providing for aided and directed settlement on the Federal irrigation projects. The text of one of the bills follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That when used in this act—

(a) The word "Secretary" means the Secretary of the Interior.

(b) The words "reclamation law" mean the act of Congress of June 17, 1902 (Thirty-second Statutes at Large, page 388), and acts amendatory thereof or supplementary thereto.

(c) The words "reclamation fund" mean the fund provided by the reclamation law.

(d) The word "project" means an irrigation project authorized by the reclamation law.

(e) The word "farm" means an area of privately owned irrigable land of more than ten acres and not exceeding one hundred and sixty acres.

(f) The words "farm unit" mean an area of irrigable public land of more than ten acres and not exceeding one hundred and sixty acres designated by the Secretary as a farm unit.

(g) The words "farm-worker's unit" mean an irrigable area of public land not exceeding ten acres designated by the Secretary as a farm-worker's unit to provide an area sufficient for dwelling and necessary outbuildings and for a garden on which the settler and his family may grow products necessary for their own food supply.

(h) The word "landowner" means the holder of title to a farm on a project.

(i) The word "settler" means a person having such farm experience, capital, health, industry, and other qualifications as may be prescribed by the Secretary, who has entered into a contract with the Secretary to secure title to a farm unit or a farm-worker's unit, and who shall actually reside on and cultivate the land.

(j) The word "purchaser" means a person having such farm experience, capital, health, industry, and other quali-

fications as may be prescribed by the Secretary, who has entered into a contract with a landowner to purchase a farm, and who shall actually reside on and cultivate the land.

SEC. 2. In connection with the settlement and development of the privately owned land on any project, the Secretary is authorized in his discretion to advance not exceeding the sum of \$3,000 on account of any one farm for effecting necessary permanent improvements. These improvements may include preparation of land for irrigation, development of stock and domestic water supply, erection of dwelling and other farm buildings, and other improvements of a permanent character. These advances shall not exceed 80 per centum of the value of the improvements and shall be secured by a first mortgage or such other instrument creating a first lien as the Secretary may prescribe covering the land and improvements, except as otherwise provided in section 5 hereof: *Provided*, That prior to the making of such advances the owner of such land shall execute a trust agreement or other suitable document in form approved by the Secretary providing for the sale of such land to an actual purchaser at prices and upon terms fixed by the Secretary. This provision regarding sale of land may be waived by the Secretary if the landowner agrees to and resides on and cultivates the land himself and possesses the necessary qualifications as herein specified for settlers and purchasers, and provided such area does not exceed one hundred and sixty acres of irrigable land.

SEC. 3. The Secretary is authorized, in his discretion, to make advances for or to clear, level, and otherwise prepare for irrigation all or any portion of farm units or farm-worker's units and erect thereon dwellings and farm buildings, and to provide stock and domestic water supply and other necessary permanent improvements in advance of or after settlement but not until the land has been purchased by an approved settler when, in his judgment, it is necessary or advisable to do so to secure the proper settlement and development of project lands. The cost thus incurred for such development as fixed by the Secretary or advances for development, or both, shall be charged against each farm unit or farm-worker's unit, as the case may be, and shall be fixed separate and apart from the cost of the water right. Each settler shall make to the United States an initial payment equal to 20 per centum of the cost of improvements effected before settlement. Advances shall not exceed 80 per centum of the value of the improvements: *Provided*, That the total amount of money spent by the United States in effecting improvements as above specified, together with the amounts advanced to settlers, shall not exceed \$3,000 on any one farm unit and \$1,000 on any one farm-worker's unit.

SEC. 4. All sums advanced to landowners or to settlers, including the cost of effecting permanent improvements as herein specified, excepting the initial payment provided for in section 3 hereof, shall be refunded to the United States with interest at the rate of 4 per centum per annum in semiannual amortized installments in not to exceed twenty-eight years under terms and conditions to be fixed by the Secretary. The charges on account of development or advances,

or both, shall become and remain a lien against said land until fully paid.

SEC. 5. The construction charges and the charges for operation and maintenance against any land involved hereunder on account of the appurtenant water right shall be paid under proper contracts executed or to be executed therefor in accordance with the requirements of the reclamation law, and the lien on account of such water right shall be merged with or stand on a parity with the liens authorized hereunder for development or advances, or both.

SEC. 6. The Bureau of Reclamation, under the direction of the Secretary, shall determine the amount of all advances and the purpose for which they shall be used and shall exercise such supervision over their expenditure as will insure economy and efficiency. Each landowner or settler securing the benefits of this act shall at his own expense insure and keep insured against fire all buildings erected through the aid of Government advances, the insurance policies therefor to be made out in favor of the Secretary or such other official as may be prescribed. The Secretary shall by regulation or otherwise provide that all landowners and settlers and their successors or assigns (who shall be acceptable to the Secretary) shall until all sums advanced are fully paid cultivate the land in a manner to be approved by him and shall keep in good order and repair all buildings, fences, and other improvements situated thereon, reasonable wear and tear excepted.

SEC. 7. In case of default on the part of any landowner to comply with any of the

terms of mortgage or such other similar instrument as the Secretary may prescribe the Secretary shall have the right to proceed under the laws of the State within which the land is located to foreclose under the mortgage or other similar instrument.

SEC. 8. In case of default on the part of the settler to comply with any of the terms of his contract or with any regulations promulgated by the Secretary under this act, continuing after one year's notice, the Secretary shall have the right at his discretion to cancel said contract and thereupon shall be released from all obligation in law or in equity to convey the property and the settler shall forfeit all rights thereto and all payments theretofore made shall be deemed to be rental paid for occupancy. The Secretary shall thereupon be entitled to the possession of said property. The failure of the Secretary to exercise any option to cancel contract for default shall not be deemed a waiver of the right to exercise the option to cancel said contract for any default thereafter on the settler's part. No forfeiture so occasioned by default on the part of the settler shall be deemed in any way or to any extent to impair any lien or security on improvements or other property which may be obtained as provided in this act.

SEC. 9. For the purpose of giving effect to this act there is authorized to be appropriated the sum of \$500,000 from the reclamation fund.

SEC. 10. The Secretary is authorized to perform any and all acts and to make all needful rules and regulations for effectuating the purposes of this act.

How the East Profits from Western Reclamation

AN article in a recent issue of the Yakima Morning Herald states that eastern firms took about \$30,000,000 from the Yakima Valley, Wash., last year in return for goods and merchandise of all descriptions purchased by the residents of Yakima, Benton, and Kittitas Counties, according to an estimate prepared by the Yakima Chamber of Commerce.

The estimate was reached after considerable research and was based upon several reliable sources of information. While the chamber officials conceded that corrections may be in order on some of the items, they felt that the compilations were not far off the mark on most of them.

AUTO VALUES HIGH

No attempt was made to obtain the figures on the number of automobiles shipped from the East into Benton and Kittitas Counties, but records showed there were 1,929 motor cars, valued at \$2,500,000, shipped into Yakima County last year.

Tires and accessories shipped in were worth \$2,000,000, and farm machinery,

farm tractors, plows, and other agricultural implements produced by eastern manufacturers and sold in the three counties were valued conservatively at \$1,000,000.

PITTSBURGH SHIPS HARDWARE

Hardware, building, and plumbing supplies furnished the valley by the Middle West and East were appraised at \$2,050,000, of which there were 250 cars of hardware from Pittsburgh and the Eastern States worth \$1,500,000; 10 cars of hardwood from Arkansas and Michigan, \$25,000; 4 cars of celotex, \$10,000; \$15,000 worth of metal lath from Pittsburgh; and other materials for building and plumbing that cost \$500,000.

Breakfast foods, mixed groceries, and canned goods from the East were worth \$4,000,000. Ready-to-wear clothing, shoes, and other articles of apparel shipped in were valued at \$4,500,000, and cotton and woolen goods, which included mattresses, made in the East, were bought with \$2,200,000 of valley money.

FARMERS RECEIVE CORN

Although western factories rapidly are taking away the furniture business from Middle West and eastern firms, the latter disposed of \$1,700,000 worth of furniture and household supplies in the valley last year.

Valley farmers may be interested particularly in the fact that Iowa, Nebraska, Kansas, and Illinois supplied the three counties with 100 carloads of corn worth \$120,000. The chamber heads and others seeking to promote the growing of more corn in the valley hope the time is not far off when the shipments of the middle-west product will be replaced with corn raised on the home farms.

RADIO SETS COSTLY

One thousand radio sets valued at \$100,000, five cars of pianos, four cars of phonographs, and other musical instruments worth another \$100,000 were shipped here from New York, Pennsylvania, and New Jersey. Other articles and their estimated value were: Drugs and sundries, \$750,000; about 825 carloads of fruit packing house and orchard supplies, \$825,000; 15 cars of eastern lubricating oils, \$25,000; millinery, notions and crockery, \$500,000; and miscellaneous items, \$2,000,000.

Insurance premiums paid to eastern companies totaled approximately \$5,000,000, but, the chamber pointed out, not all of that money was lost to the valley, as much of it was returned in the form of death and accident claim payments and fire loss payments.

It is estimated that when the Yakima Valley is fully developed, with 600,000 acres under irrigation instead of the 350,000 acres now being cultivated, business with the East will amount to between \$75,000,000 and \$100,000,000 annually. Similar statistics concerning the tremendous flow of trade to the East as a result of irrigation development might be compiled for all of the Federal irrigation projects.

Economic Results on Tule Lake Lands, Klamath Project

ON March 1, 1927, the Bureau of Reclamation opened to entry 145 public land farm units comprising 8,051 acres in the Tule Lake division of the Klamath project, Oregon-California. On December 20, 1927, 143 units, comprising 7,938 acres, had been entered.

The assets of the 143 entrymen at the time the land was entered were distributed as follows:

	Total	Average
Cash, bonds, or other securities.....	\$206,750	\$1,446
Livestock and equipment.....	390,170	2,728
Other assets.....	370,362	2,590
	967,282	6,764

Improvements completed to December 15, 1927, were as follows:

	Number	Average cost	Total cost
Houses:			
Cost less than \$500..	50	\$294	\$14,680
Cost \$500 but less than \$1,000.....	35	581	20,325
Cost \$1,000 but less than \$1,500.....	9	1,033	9,300
Cost \$1,500 but less than \$2,000.....	6	1,533	9,200
Cost \$2,000 or over.....	7	2,586	18,100
			71,605
Barns, garages, chicken houses, etc.....	68	163	11,103
Domestic water systems:			
Surface wells.....	41	27	1,105
Deep or drilled wells.....	23	242	5,576
			6,681
Fence (miles).....	69	197	13,561
Acres cleared and leveled.....	1,737	15	25,579
			128,529
Total cost of all improvements.....			
Number of farm units with improvements.....	115		
Average value of improvements per farm unit.....			1,118

During 1927 the cultivated area amounted to 3,299 acres, of which 1,480 acres were cropped, producing crops valued at \$21,326. Of the balance, 1,261 acres were in young alfalfa and 558 acres in summer fallow to kill sod.

Nearly 75 per cent of the entrymen came from Oregon, the previous location of 106 entrymen being given as from that State. California furnished 25; Washington, Missouri, and Louisiana 2 each; and Arizona, Idaho, and Illinois 1 each. The previous location of 3 entrymen was not stated.

Dairying Results on the North Platte Project, Nebraska-Wyoming

THE report of the North Platte Valley Dairy Development Association for the six-month period July 1 to December 31, 1927, shows that loans totaling \$44,575 have been made to farmers on the project by the association.

Nineteen carloads of choice dairy cows have been placed on 88 farms. Of the 19 cars, 3 were purebreds and the balance high-bred stock, principally Holsteins. The 538 head contained in the shipments were placed on the farms at an average cost to the buyers of \$110.76 per head.

One hundred additional head of choice stock have been shipped in recently from Wisconsin, and the association is planning to ship in 1,000 head of high-bred stock during 1928 for distribution throughout the valley. The North Platte Valley Dairy Development Association is stated to be the second highest buyer of stock in the dairying section of Wisconsin.

The association is doing extensive work in stimulating the dairy industry throughout the valley and in providing a steady year-round source of income for the farmers of the district, according to a recent issue of the Scottsbluff Star-Herald.

From the same source comes the statement that the North Platte Valley Cow Testing Association produced more butterfat per cow than any other testing association in the State, due to the fact that this territory has better dairy feeds and a better class of dairy cows, practically all of which were brought in originally from Wisconsin.

An enviable record was made by Mr. Moore, his 27 cows producing an average of 453 pounds of butterfat. His 6 high cows produced an average of 537 pounds of butterfat. Eight members of the association had an average of more than 300 pounds of fat.

The winning of first place is a very important agricultural achievement of which the members and the entire community are proud.

Uncompahgre Project Lamb-Feeding Test

The lamb-feeding test which is being carried on by the extension service of the Colorado Agricultural College on the L. W. Sweitzer ranch on Garnet Mesa, Uncompahgre project, is progressing satisfactorily.

It was planned originally that a 110-day period would be required to have the lambs in condition for marketing, but after the completion of a 60-day period on January 10 it was believed that the full time would not be required because of the good gains already made.

The lambs are divided into 10 lots; one lot being fed corn and hay; another barley and hay; another hauled beet tops and hay; another pastured tops and hay; another pastured tops and hay with corn to finish; another hauled tops, corn, and hay; another pastured tops, corn, and hay; another pastured mangels, pastured corn, and hay; another wet pulp, corn, and hay; and another wet beet pulp, molasses, corn, and hay. The average weights of the various lots per lamb on January 10 ranged from 73.8 pounds to 82.2 pounds.

Construction Collections Show Great Improvement

THAT the financial adjustments provided for by the acts of December 5, 1924, and May 25, 1926, generally known as the "fact finders' act" and the "omnibus adjustment act," respectively, have greatly accelerated the rate at which the reclamation fund is revolving is shown by the accompanying graphic comparison of collections of construction water-right charges during the calendar years 1925, 1926, and 1927. The collections during 1927 exceeded the collections during 1926 by more than \$1,000,000 and exceeded the collections during 1925 by approximately \$700,000. The reduced annual construction charge installments are being met promptly by the water users.

During the first decade of operations under the reclamation act of June 17, 1902, the funds necessary to finance this work were obtained mainly from the proceeds of the sales of public lands in the Western States. During the period of 1914 to 1918 these receipts were augmented by a loan of \$20,000,000 from the general treasury. In 1921 additional funds were made available from royalties and rentals from oil and potassium leases of public lands. However, during the past few years accretions to the fund from these sources have diminished materially. The following table is a statement of the amount that has been available for reclamation during the period 1902 to 1927, inclusive:

Accretions to fund:	
Receipts from sale of public lands and town lots.....	\$109,281,700
Receipts from oil-leasing royalties and rentals.....	32,105,100
Receipts from potassium royalties and rentals.....	36,900
Receipts from Federal power licenses.....	31,500
Total accretions.....	141,455,200
Repayment to fund, collections for construction, operation and maintenance, and incidental operations.....	74,709,600
Loan from general treasury (less amount repaid).....	216,164,800
Special appropriations.....	12,750,000
Special appropriations.....	5,169,500
Total available.....	234,084,300

The reclamation construction program now in progress will require \$56,000,000. As the accretions to the fund from the sale of public lands and from oil royalties and rentals are diminishing year by year, the progress of the present construction program and the continuation of the present national policy of reclamation depend largely upon the prompt repayment by project water users of the annual construction charge installments.

Graphic Comparison of Construction Collections by Calendar Year

\$3,000,000

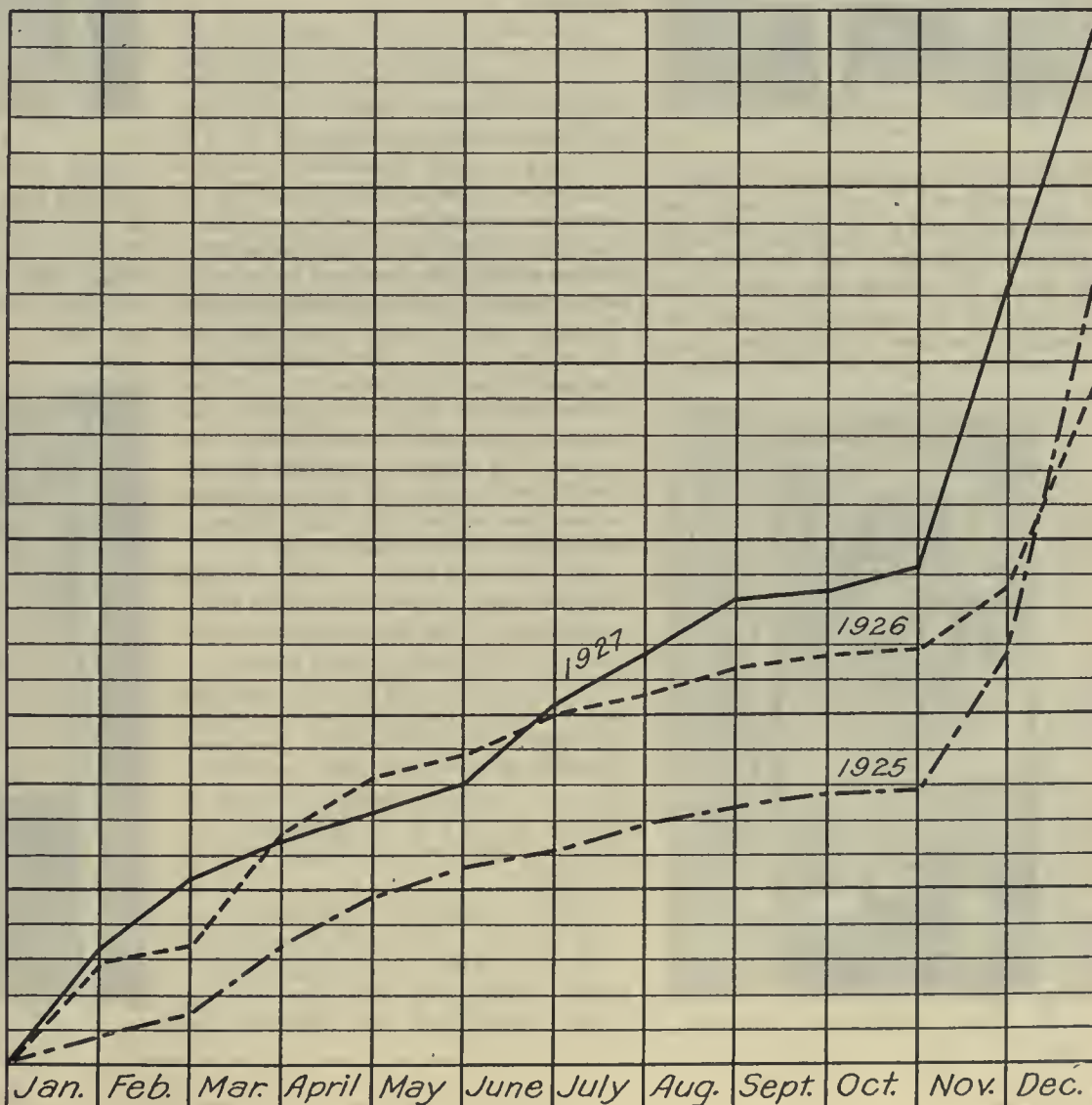
2,500,000

2,000,000

1,500,000

1,000,000

500,000





Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor, New Reclamation Era



Necessity is the Mother of Invention



FIG. 1

FARM journals, magazines, and papers catering to subscribers on farms are continually seeking to help solve the problems of the farm and the home on the farm. By mixing with farm folks you find out how resourceful they are. Experience teaches both the farmer and his wife many short cuts and improve-



FIG. 2

ments. If prosperity favors them improvements take the form of standardized equipment, the first cost of which is often high, but which pay for themselves while being used in the saving of energy, often effecting larger output and increase in quality.

But there are "lean" years when the farmer is getting established or, after getting his start he has reverses that set him back, and it is only by the strictest economy and thrift that the farmer and his family weather the storm, that resourcefulness is given a full opportunity to be demonstrated. Spurred on by the continued desire for the comforts and better things of this life, some very interesting and useful conveniences are contrived.

Of course, the kitchen comes in for attention by the housewife because the major portion of her time is spent there. Efforts are usually directed to saving steps and the following is an example.

Having a closet containing a hinged shelf which can be let down to do duty as a counter or table is a good arrangement. (Fig. 1.) Where there is not room for a kitchen cabinet the closet can be made to serve instead. With the shelf up as in Figure 2, the door can be shut and the contents of the closet protected from the dust and concealed effectively.

The farmer's wife who planned this ingenious use of a closet entered her kitchen in a county better-kitchen contest, under the terms of which each contestant was to make the most improvement possible for the least outlay.

The closet was fitted up with a hinged drop shelf which rested when down on an extension leg. The equipment and materials for baking were grouped together in front of the shelf, and a high stool [was placed near by, ready for use. Groceries were kept on the shelves above, in cartons, glass jars, or other neat, tight, containers. Whatever could be hung up was placed on nails, on the door or the edges of the shelves. Cook books were kept in a rack on the door.

Another homemade cabinet shown in Figure 3 has a shelf which, like that in Figure 1 and Figure 2, is really a biscuit board. Chains hold it in place, and the tilting bins for flour and meal are also



FIG. 3

held by chains. The bins go back and the shelf drops down, Figure 4, when not in use, covering the pot closet below. The same idea could be followed inside a closet. Precautions should be taken in any case to make the bins mouse and insect proof by fitting them with tight covers.



FIG. 4

Cleaning Flat Silver

Flat silver with plain handles is the easiest to keep clean. If you have some that is hard to clean by rubbing try the electrolytic method for removing tarnish. Various commercial devices for this can be bought for use at home, or it can be done in the following way:

Fill an enameled or agateware kettle partly full of water in which has been dissolved 1 teaspoonful of either washing soda or baking soda and 1 teaspoonful salt to each quart of water. Heat this solution to the boiling point, put in strips of aluminum or bright zinc, add the tarnished silver, and boil it. The silver must be covered completely by the water and each piece must be in contact with the aluminum or zinc, either directly or through other silver.

When the tarnish has disappeared, the silver should be removed from the kettle, washed, and dried with a clean, soft cloth.

This method is *not* recommended for silver with a dull or satin finish.



Dr. Elwood Mead, Commissioner of Reclamation, photographed at his desk in the Interior Building on his seventieth birthday

Belle Fourche Woman Prize Winner

Last spring or early summer the Great Western Sugar Co., of Denver, Colo., put on a contest, the following States to participate, North Dakota, South Dakota, Nebraska, Kansas, Missouri, Oklahoma, Iowa, and Minnesota.

The contest called for three samples of one-half-pint glasses, one each of cherry and currant jell and one of strawberry preserves. The samples were to be accompanied by an essay of 300 words describing the method of making them.

The contest was open to clubs and societies. No individual could be entered, but the samples and the essay were to be one woman's work who belonged to the club or society. She was to receive a free trip to Denver and be entertained for five days by the Great Western Sugar Co. The prize money went to the club or society to which this woman belonged.

The first prize in each State was \$100 and on down to \$20, \$10, and \$5, and the prize for the grand champion over the eight States was \$500. The woman who won grand champion prize of \$500 in this contest is Mrs. E. H. Dinsmore, of Kansas City.

Mrs. O. J. Soma, who represented the Horse Creek Missionary Society, of Newell, S. Dak., located on the Belle Fourche irrigation project, won first prize for South Dakota. Most of the members of this society have been on the project from its beginning and have weathered its storms.

For the past two years this society has won first prize on special No. 1 at the Butte County Fair. Mrs. O. J. Soma is its president and earned the trip to Denver. She says of the trip:

"We arrived on Monday and gathered at the Brown Palace Hotel where we were interviewed by reporters and picture men. There were also three representatives from the sugar company who were with us all the time. We had three big cars at our disposal and were taken over Denver and shown all points of interest, including the beautiful parks and gardens and were taken to theater parties and luncheons. The last two days we spent on a trip of about 260 miles through the Great Rocky Mountain National Park (which is a wonder) by the way of Estes Park and Grand Lake. To make a long story short, I had a wonderful trip and was royally treated in every way."

Woman's Importance on the Farm

"There is more than the man that we place on the land. The man is the brawn and sinew to work the land, but his wife is the backbone of the situation. Now, a happy, contented wife is your biggest advertisement, and she will radiate more happiness and sunshine in your district than any other thing you can put into it, but a discontented woman can do the reverse."

This is a quotation from the address made by Mr. W. H. Russell, colonization agent of the Lethbridge northern irrigation district, Alberta, Canada, before the conference on Federal reclamation which was held in the auditorium of the Interior Building February 14 and 15. It is a reiteration of what has been said by people in similar positions in the United States. It is good to hear it repeated and I feel sure if representatives from the different farming districts in different countries could be brought together in one meeting and asked if the woman plays an important part on the farm, the answer would be unanimously in the affirmative.

Owyhee Wool Clip Brings Good Price

Frank T. Morgan, secretary of the Owyhee irrigation district, Owyhee project, Oregon-Idaho, writes that for a number of years the Malheur County Bank, of Nyssa, Oreg., has pooled its customers' wool and sold it for them. Two or three cents a pound above the market price has always been obtained. This season's clip was contracted for recently at 35 cents a pound to J. Koshland & Co., of Boston, Mass. The clip is estimated at 750,000 pounds, which will bring the growers \$262,500. Nearly all of the sheep were wintered in the vicinity of Nyssa.

Standard High-Pressure Gates

By P. A. Kinzie, Engineer, Denver Office, Bureau of Reclamation

THE enormous forces which must be controlled and held within bounds when liberating irrigation water at heads of 75 feet or more are not generally realized even by many who utilize the appliances which accomplish that result.

At Tieton Dam on the Yakima project, Washington, two high-pressure gates 5 feet wide by 6 feet high are installed beneath the dam, where they work under a maximum pressure of 200 feet of water. When operating under this head, a volume of water passes through their portals each second sufficient to fill a box more than one-half mile in length by 1 foot wide and 1 foot deep.

Were this water compelled to flow through a box of this size, its velocity of passage would be such that the distance traveled in one second of time would be approximately that of a bullet fired from a high-power sporting rifle.

This water carries an enormous amount of energy, which, if converted into a useful and visible form, would be equal to 15,600 two-horse teams, and were these teams hitched one behind the next in tandem formation, there would be a double line of horses extending down the road more than 30 miles!

From this it is evident that the tasks required of such gates as these are no light ones, and that their rugged construction shown in the illustration is not inappropriate.

USUAL PLAN OF GATES

From the illustration it will be seen that a standard high-pressure gate normally consists of two rectangular castings forming the water passage for a distance upstream and downstream from the leaf approximately the same as the horizontal width of the passage, the two mating joint faces of these castings being recessed on their vertical sides to carry the bronze seats upon which the seat strips mounted upon the downstream face of the leaf bear and slide as the leaf is moved up and down, the leaf with its stem extending vertically through the envelope or bonnet, the two flanged castings forming the envelope extending upwards from the gate frames, and carrying the cover, which in turn extends vertically upwards and carries the hydraulic cylinder.

This general arrangement of the main parts insures easy assembly and maintenance, and provides a completely self-contained structure capable of withstanding the reactions produced by the hydraulic cylinder, which in the larger

sizes amount to several hundred thousand pounds.

In the earlier installations these heavy reactions were transmitted to the tunnel roof above by strut members attached to the cylinder heads, and into the foundations by heavy embedded anchorage members, but in many places where it was desired to use these gates this method was found impracticable, and the present arrangement was adopted.

A gradual process of evolution commencing with the first installations has occurred in the design, construction, installation, and operation of these gates; and as experience and use have developed desirable improvements or revealed inherent weaknesses, these improvements have been included and the weak or undesirable features removed from those which came after. The amount of material required for their fabrication has been diminished somewhat, and the distribution of forces within them has been bettered by rearranging the shape and position of the parts in such manner as to more advantageously resist and disseminate the stresses into those parts of the structure which formerly were giving smaller portions of their inherent strength to this purpose. The task of the manufacturer in producing them in the foundry and the shop has been lightened step by step by changes and additions which, although not radical or revolutionary in their character, or of great moment singly, have in their cumulative effect enabled the Government to purchase, transport, and make final installation in a shorter time and at a lesser cost than otherwise would have been possible.

Experience derived from any diversified installations over a considerable period of time clearly shows that these gates can not safely be used for the regulation of flow through protracted periods of time when the head on the gates is greater than 75 feet. Expressing this in another way, these gates can be built to successfully close and open against the highest heads yet encountered by the Bureau of Reclamation, but they will not function satisfactorily for any considerable length of time when operated at partial opening as is frequently required for regulation purposes, as in irrigation release, at heads greater than 75 feet. The reason for this is that when the leaf is in the partially open position, and water is passing beneath it under the high velocities produced by heads greater than 75 feet, the vibration of the leaf produced by the high

velocity of the water becomes very acute, and this condition is accentuated by the vacuum produced when discharging into a conduit whose outer end is water sealed, and having no air inlet immediately below the gate leaf.

When a condition of this sort arises one practicable solution is to attach a balanced needle valve below the gate, admit air downstream from the gate leaf, open the gate wide, and use the needle valve below it for regulating purposes.

In the first installations the importance of avoiding all possible abrupt changes in the surfaces of the water passages, such as recesses, bolt heads, etc., and of the necessity of the admission of air below the gate leaf was as yet unknown, and these earlier installations had been in service only a comparatively short period when it was discovered that the metal downstream from each bolt, recess, or other break in continuity of the water passage surfaces was being eaten away at an alarming rate.

VIBRATION AND CAVITATION

Of the first gates of this general nature put into operation under high heads were those at Roosevelt Dam, Salt River project, Arizona, in 1908, which were intended for service under a maximum head of 220 feet. These two sets of three gates each were 5 by 10 feet in size, and their hoist cylinders were located in wells extending from the top of the dam to a point 33 feet above the sluiceway floor. The gates were put into operation under heads much less than their designed capacity, and upon later inspection their condition and that of the tunnel below them revealed that serious damage had occurred. The concrete and metal linings had been loosened, damaged, or washed out, the bolts and fastenings of the gates themselves had become loosened and in some cases were missing, the bronze seats damaged by the blows of loosened parts, and the bronze roller trains used behind the gate leaves either broken or carried entirely away. The concrete in the floor, roof, and walls was badly eroded by the water jets, and there were holes torn in the tunnel floor from 4 to 6 feet deep. Repairs were made, but the continued release of water through these gates damaged them still further until finally they could no longer be safely used and they were abandoned, the tunnel was plugged with concrete, and two 38-inch needle valves, protected by bronze slide gates were installed.

At Pathfinder Dam, North Platte project, Wyoming, in 1909, four 44 by 77 inch high-pressure gates were installed in the north tunnel, which is cut through solid granite. When the discharge from these gates was sufficient to nearly fill the tunnel below them, it was noticed that reverberating and hammering sounds issued from its outlet end, and that the intensity of these noises increased as the flow from the gates increased. These hammering, pounding reverberations fluctuated, resembling an approaching thunderstorm, varying from low and indistinct rumblings during the incipient stages to sharp peals and explosions during the periods of maximum discharge, and attaining such violence as to cause the dam and canyon walls to tremble. A draftsman's triangle hanging on a nail on the wall of the operator's house some distance back from the canyon was observed to dance and quiver in time to the violent detonations. Upon the water being shut off and an inspection of the gates and the tunnel below being made, a condition somewhat similar to that found at the gates of Roosevelt Dam was disclosed.

The solid granite walls, floor, and roof of the tunnel had large masses torn out, portions of the concrete below the gates were destroyed or damaged, the three-fourths-inch steel plate linings were torn as if made of paper; anchor bolts were sheared off in some cases and the nuts stripped from the bolts in others. The gates themselves, having been operated wide open, had suffered little injury.

The damage was repaired, an inclined air shaft cut through into the tunnel roof immediately below the gates, and when water was again turned through them, it was found that the airway had removed the damaging influences so markedly apparent formerly.

From the experience derived from these first installations, it was found essential to have the walls of the water passages free of cavities and projections and to admit air in large quantities into the water passage immediately behind the gate leaf. When this was done, the later installations were found to be practically free of these destructive vibrations and the erosive effects, now known as "cavitation," even when working under greater heads and higher velocities than those encountered in the earlier installations.

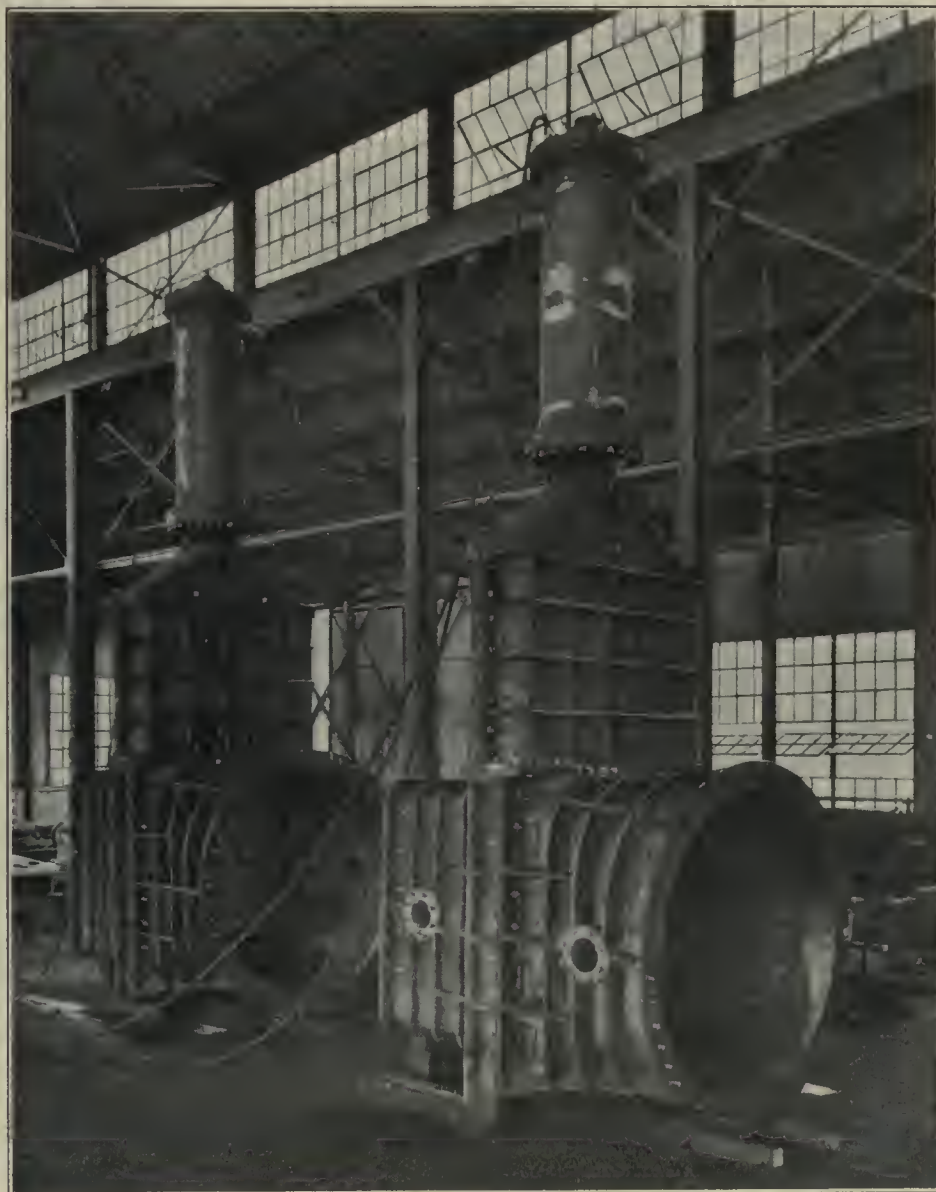
WIDE RANGE OF USE

The diversity of uses to which gates of this type may be applied is of wide range. Storage reservoirs having heads on the outlet conduits of 70 feet or under utilize one or more of this type for outlet

and control regulation purposes. An excellent example of this condition is found at the newly completed American Falls Dam on the Minidoka project, Idaho, where a battery of twenty 5 by 5 feet high-pressure gates are used to release and regulate the irrigation and power water through the dam under a maximum head of 70 feet. These gates are embedded within the concrete of the dam, and their bonnet covers and hoist cylinders rise above the floor of the operating gallery. Two common header pipe lines on the gallery wall run the length of the gate battery, with a pipe connecting the top of each hoist cylinder to the top header, and another pipe connecting from the bottom of each hoist cylinder to the bottom header. A stop valve is provided in each of these pipes connecting the cylinders to the headers, and an electric push-button control station on the

wall immediately behind each hoist cylinder. Two triplex motor-driven pumps with automatic safety pressure release are placed midway of the length of the gallery, and by a simple arrangement of valves the operator can put pump pressure into either the top header for closing the gates or the lower header for opening them, the header line opposite that carrying pump pressure being used in either case as the return line. Having set the valves at the pumps for the closing or opening of the gates, as the case may be, the operator can then go along the battery of gates and by opening the stop valves at each hoist cylinder can put any or all of the gate battery into action as he wills, and by the push-button control station provided at each gate he can also start and stop the pumps.

This type of gate is frequently used under high heads in the pipe line between



High pressure gates for Gibson Dam, Sun River project, Mont., undergoing shop tests

the reservoir and a balanced needle valve as an emergency gate. It may, by means of a transition casting, be mounted directly on the upstream end of the needle valve, as in the case of the two 58-inch balanced needle valve installations in the north tunnel at Pathfinder Dam, North Platte project, the gates being designed for such direct connection to the needle valves, or they may be installed several hundred feet upstream in a chamber under the dam, at the upper ends of the pipe lines or penstocks leading to the balanced needle valves, as was done at Tieton dam, Yakima project, and at McKay dam, Umatilla project. In these two cases last mentioned, the gates are embedded in the concrete tunnel plugs with the joints between the bonnets and the bonnet covers nearly flush with the floor of the operating chamber, this arrangement permitting disassembling of the hoist cylinders and covers, the withdrawal of the stem and leaf and the renewal of the seats, etc., without disturbing the remaining main castings, embedded. By closing these gates, any painting, maintenance, or inspection work can be performed upon the penstocks or the needle valves below.

This type of gate makes an excellent closure for sluiceways under the higher heads. The bottom of the power intake tunnel elbow at Guernsey Dam, North Platte project, Wyoming, is equipped with three 5 by 5 foot gates which permit sluicing silt through into the diversion tunnel. These gates are also intended for use in releasing irrigation water whenever the reservoir water surface falls below the floor of the north spillway. Two of these gates have automatic hydraulic gate hangers which will carry the two outside gates in the wide open position, and the center gate is equipped with a mechanical hanger which will carry the leaf in either wide open position or any intermediate position required for the close regulation of the outflow. This hanger is provided with electromagnetic interlocks between it and the hydraulic control valves, which operate its gate, so that improper sequence of operation of the valves and of the hanger is prevented.

OPERATION OF EMERGENCY GATES

When gates of this type are used under conditions where they are known as emergency gates, the ability to operate them under the most adverse conditions is of supreme importance, as their failure to function under these conditions might mean the loss of a dam representing several millions of dollars, together with the possible loss of life and the untold damage to the lands, highways, bridges, and settlements below. In such cases the gates

are usually provided with a remote control system which may be located on top of the dam with a wholly independent pressure pump from that used when operating under direct control like the direct and remote control systems provided for the two 5 by 6 foot gates at Tieton Dam; or they may be installed with a remote control system with the pressure pump and the control valve board located in the outlet works house with the balanced needle valves similar to that at McKay Dam, where the hydraulic piping connecting the emergency gates in the tunnel chamber beneath the dam with the outlet works house at the downstream toe of the dam is embedded

in the concrete lining of the tunnel so that a rupture in one or both of the penstock lines with the attendant rush of water through the tunnel can not carry this piping away. The two gates in this case are provided with automatic gate hangers each of which has an automatic electric signalling system which indicates upon the signal board immediately above the control valves in the needle valve house the position of each gate and the sequence of action of each hanger.

NOTE.—The Bureau of Reclamation standard designs for 4 by 4 foot and 5 by 5 foot high-pressure gates are available in published form, consisting of sets of eight lithograph prints, 8 by 10½ inches. These prints may be obtained from the chief engineer's office at Denver at a price of \$2 per set.

International Water Commission, United States and Mexico, Meets

AS copy goes to the printer for this issue of the ERA, the American and Mexican sections of the above-mentioned commission are planning their first joint meeting at El Paso, Tex. The American section is made up of Dr. Elwood Mead, chairman; Gen. Lansing H. Beach, United States Army, retired; W. E. Anderson, of San Benito, Tex.; and M. A. Schnurr, secretary. The Mexican section is composed of Gustavo P. Serrano, chairman; Federico Ramos; and Javier Sanchez Me-jorada.

The commission was set up by act of Congress of May 13, 1924, and had funds to its credit for operating up until July 1, 1927. At that time the funds lapsed, and owing to the failure of the deficiency bill pending in the Sixty-ninth Congress, the commission found itself without funds on July 1, 1927.

Until that time members of the Mexican section had not been designated by the Mexican Government. Shortly thereafter, however, the American section was notified that Mexico was ready for a meeting. This meeting had to be postponed until Congress met in December and provided the necessary funds, which it did by a deficiency act which passed December 22, 1927. With funds available, communication with the Mexican section was immediately held and the earliest convenient date decided as February 27.

The commission plans to meet a short time at El Paso, and then visit the territory involved in its studies.

The findings of the commission will be shaped into recommendation to Congress, to form the basis of a treaty between the Republic of Mexico and the United States for the equitable distribution of

our three international streams on the south, the Rio Grande, Colorado, and Tia Juana.

Illustrated Booklets Meet Educational Needs

The Washington office has on hand several thousand copies of the illustrated booklet "Federal Irrigation Projects" which it has found of considerable value in supplying information concerning the projects operated by the bureau. This booklet contains a short introduction telling of the need for reclamation, of the passage on June 17, 1902, of the reclamation act, and of the accomplishments under the act. This is followed by brief descriptions and illustrations of a few of our important storage and diversion dams, then by short paragraphs outlining the methods of financing the construction of the projects and the repayment of the costs by the settlers after they have acquired their farm units, and then a brief description of each project with appropriate illustrations.

Schools, clubs, and other organizations are making daily requests for supplies of this booklet in lots of 25, 50, or more for educational purposes. If any project organization cares to obtain copies of this publication without charge, a letter addressed to the Commissioner, Bureau of Reclamation, Washington, D. C., will receive prompt attention.

Eggs deteriorate rather rapidly if held longer than five days, and none should be saved for incubation more than 10 days.

Recent Legislation by Congress

Special provisions of the first deficiency act, fiscal year 1928, approved December 22, 1927

INDIAN LANDS, NEWLANDS PROJECT

Paiute allotted lands, Truckee-Carson project, Nevada (reimbursable): To carry out the provisions of the act entitled "An act to authorize the cancellation and remittance of construction assessments against allotted Paiute Indian lands irrigated under the Newlands reclamation project in the State of Nevada and to reimburse the Truckee-Carson irrigation district for certain expenditures for the operation and maintenance of drains for said lands," approved June 26, 1926, fiscal years 1924 and 1925, \$611.55.

REFUNDS ON CLASS 6 LANDS

Refund of construction charges: For refunds of construction charges heretofore paid on permanently unproductive lands excluded from the Federal reclamation projects specified in the act approved May 25, 1926, in accordance with section 42 of such act, fiscal years 1928 and 1929, \$100,000, to be paid out of the reclamation fund.

FLOOD LOSS, RIO GRANDE PROJECT

For personal services and traveling and other expenses necessary to enable the Secretary of the Interior to determine the property loss by flood sustained by certain property owners residing at or in the vicinity of Hatch and Santa Teresa, New Mexico, in accordance with the pro-

visions of the act of February 25, 1927 (Forty-fourth Statutes at Large, page 1792, Private, Numbered 396, Sixty-ninth Congress), \$5,000, or so much thereof as may be necessary, to be expended from the reclamation fund.

INTERNATIONAL WATER COMMISSION

International water commission, United States and Mexico: The unexpended balance of the appropriation of \$20,000 made by the second deficiency act, fiscal year 1924, and continued available until June 30, 1927, for the Commission on Equitable

Use of Waters of the Rio Grande, shall remain available until June 30, 1928, for the expenses, including the purchase, at not to exceed \$1,500, and maintenance of a passenger-carrying motor-propelled vehicle, of the commission authorized by the resolution approved March 3, 1927, entitled "Joint resolution amending the act of May 13, 1924, entitled 'An act providing a study regarding the equitable use of the waters of the Rio Grande,' and so forth."

Any moneys received from the Republic of Mexico for the purpose of securing information on which to base a treaty between the United States and Mexico relative to the use of the waters of the Rio Grande, Lower Colorado, and Tia Juana Rivers as authorized by the act of March 3, 1927, shall be covered into the Treasury.

Contracts Calling for Performance "To the Satisfaction" of a Government Officer

IN Steacy-Schmidt Manufacturing Co. v. the United States, decided by the Court of Claims January 23, 1928, the court passed upon a case where the Department of the Interior had granted extensions of time on account of certain delays in delivering materials in connection with the King Hill and Riverton projects, and where on the theory that such extensions were validly granted, payment was made to the contractor without deductions of liquidated dam-

ages, as provided for in the contracts, for delays by reason of unforeseen causes beyond the control of the contractor. The Comptroller General, in passing upon the settlements, held that the extensions of time were improperly granted, and made deductions for liquidated damages against other credits of the company. The company took the case to the Court of Claims, and the court stated:

In accordance with the express provision of each contract the full amount of the contract price was payable "when all the material shall have been received at its destination and the terms of the contract shall have been fully complied with to the satisfaction of the engineer, and a release of all claims against the United States under or by virtue of the contract shall have been executed by the contractor and filed with the engineer." The terms of the contract were complied with "to the satisfaction of the engineer," a release of all claims against the United States was executed by the contractor, and the full amount of the contract price was paid. In the absence of fraud or mistake, or of lack of authority on the part of the engineer or other governmental agents concerned in the transaction, both the Government and the plaintiff were bound by the final settlement. Plaintiff is entitled to recover the amount sued for, and it is so ordered.



!Baby beves on the Belle Fourche project, S. Dak

TWELVE cars of Bliss Triumph certified seed potatoes were moved recently from the Milk River project to southern markets at \$1.50 a bushel.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, and Miss Mae A. Schnurr, secretary to the commissioner, planned to leave Washington, D. C., on February 21 to attend the first joint meeting of the Mexican and American sections of the International Water Commission at El Paso, Tex., on the 27th. Doctor Mead is chairman of the American section and Miss Schnurr is secretary.

L. N. McClellan, electrical engineer, Denver office, spent several days in the Washington office in connection with the proposed power development at American Falls and the interpretation of the contract with the Idaho Power Co.

Benjamin C. Hillard, commissioner of municipal waterworks, Denver, Colo., and W. H. Nalder, engineer from the Denver office, were recent visitors at Stony Gorge Dam, Orland project.

H. W. Bashore, construction engineer, Vale project, visited the Boise project office during the month.

Mac T. Hardwick, recorder of surveys, Minidoka gravity extension unit, has resigned to return to college.

H. F. McPhail, engineer, Denver office, was on the Shoshone project recently to make an inspection of the power system and of the distribution system of the Oil Fields Power Co.

B. E. Stoutemyer, district counsel, was a recent visitor on the Boise, Minidoka, and Vale projects.

John A. Whiting, State engineer of Wyoming, was on the Riverton project during the latter part of the month.

Collections by Burley Irrigation District

The Burley irrigation district, Minidoka project, Idaho, recently closed a very successful collection campaign, according to an item in the Burley Bulletin. Statements covering the 1927 construction charge were mailed November 1, 1927. Collections began immediately and continued at a steadily increasing rate until December 19, the last day of the collection period, when more than \$10,000 was received. Total collections during November and December were \$70,646.96.

The 1927 construction charge on consenting lands totaled \$110,955.45, of which one-half, or \$55,477.73, became delinquent if not paid by December 19. Collections of this charge totaled \$51,617.97. The 1927 construction charge on nonconsenting lands totaled \$16,511.13, all of which was due and payable on December 1, of which \$14,692.16 had been collected by the end of the year. In addition, \$3,419.61 was paid on delinquent 1926 construction charges and \$489.74 on advance 1928 operation and maintenance charges.

These collections enabled the district to meet in full the charges due the Government on December 1 and 31, 1927.

C. D. Greenfield and Leonard Ball, agricultural development agents of the Great Northern Railway, spent several days recently on the Milk River project.

R. J. Coffey, district counsel, spent three days recently on the Orland project in connection with legal matters relative to Stony Gorge Reservoir rights of way.

W. L. Rowe is acting superintendent on the Yakima project while Superintendent Preston is absent in Washington in connection with the study of economic conditions on Indian projects.

J. R. Iakisch, associate engineer, has been engaged recently on a report of drainage conditions in the Klamath irrigation district. He has worked in close cooperation with the district directors and made a number of field inspections in company with directors or interested water users.

I. H. Sherwood, electrical engineer, Oregon Public Service Commission, was a recent visitor on the Klamath project.

J. W. Lawlor, president of the General Construction Co., contractors on the construction of the railroad to the Owyhee Dam site, visited the work during the latter part of the month.

Recent visitors on the Belle Fourche project were S. S. Long, district superintendent of the Chicago & North Western Railway, and State Game Warden Johnson, who called at the project office relative to the seining of carp in Orman Reservoir.

Recent visitors on the Rio Grande project were Barry Dibble, consulting engineer, of Redlands, Calif., and Messrs. Murphy and Wilcox, representatives of the General Land Office.

H. G. McDowell, chief of field party, Kittitas division, Yakima project, has resigned to accept employment with a private firm in Cuba.

Leslie Coffin, district manager of the Puget Sound Power & Light Co., was a recent visitor on the Kittitas division of the Yakima project.



Kittitas main canal, Yakima project, showing completed lining near Easton, Wash.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wildo Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....		Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....		B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....					
King Hill ³	King Hill, Idaho.....					
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	Erle W. Shepard.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....		R. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smitb.....	R. B. Smitb.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....					
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....		E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Provo, Utah.....					
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Hermiston, Oreg.....					
Uncompahgre.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Heim.....	J. R. Alexander.....	Montrose, Colo.
Vale.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyen.....	C. M. Voyen.....	B. E. Stoutemyer.....	Portland, Oreg.
Yakima.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
Yuma.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....		B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹²	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Dam site, Elk Creek, Calif.....	H. J. Gault ¹³	C. B. Funk.....		R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Valley Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Cache la Poudre Investigations.....	Denver, Colo.....		Poudre Valley Water Conservation Association.
Middle Rio Grande.....	Albuquerque, N. Mex.....		Middle Rio Grande conservancy district.
Columbia Basin Project.....	Lind, Wash.....	B. E. Hayden.....	State of Washington.
Truckee River.....	Reno, Nev.....	A. N. Burch.....	
Heart Mountain Investigations.....	Powell, Wyo.....	I. B. Hosig.....	State of Utah.
Utah Investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	
Cie Elum storage.....	Yakima, Wash.....	P. J. Preston.....	
Payette storage.....	Boise, Idaho.....	R. J. Newell.....	
Southern Investigations.....	Washington, D. C.....	George C. Kreutzer and C. A. Bissell.	Southern States.



FEDERAL IRRIGATION PROJECT HOMES

NEW RECLAMATION ERA

VOL. 19

APRIL, 1928

NO. 4



THE IRRIGATION SEASON WILL BEGIN SOON ON THE PROJECTS



WHAT IS RECLAMATION?



NO land is reclaimed until it has people who will live on it and work it; until it has railways, highways, drainage, churches, schools, banks, health centers, markets, towns and cities filled with businesses, places of amusement and attraction.

*Hon. T. WEBBER WILSON
Member of Congress from Mississippi*

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, 75 cents a year

HUBERT WORK
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

APRIL, 1928

No. 4

Interesting High Lights on the Federal Reclamation Projects

EASTON DAM has been decided upon as the name of the dam to be constructed on the Yakima River at Easton, Wash., for the diversion of water for the irrigation of the Kittitas division of the Yakima project.

THE Public Service Co. of Colorado has been considering the possibility of developing the power site at Orchard Mesa pumping plant, Grand Valley project, and utilizing the power which could thus be made available in the city of Grand Junction and its surrounding territory.

CONTRACT has been awarded to Hardie-Tynes Manufacturing Co., of Birmingham, Ala., for two 42-inch balanced needle valves for the outlet works at Stony Gorge Dam, Orland project, at the contract price of \$13,705.

CONSTRUCTION of Stony Gorge Dam, Orland project, has passed the stage of greatest uncertainty, the excavation and placing of foundations, and possible delays and damage by floods. If the needle valves are delivered on time the construction should proceed without hindrance to completion ahead of the scheduled time.

THE Southern Pacific Co. is advertising the Orland project farms, on which the bureau holds options, in the Nebraska Farmer, the Farmer, the Prairie Farmer, the Missouri Ruralist, the Hoosier Farmer, and Farm Life. Nearly 400 letters of inquiry concerning these farm opportunities have been received by the local office.

KLAMATH FALLS, on the Klamath project, Oregon-California, voted recently in favor of a \$300,000 bond issue for the construction of main outlet sewers and a disposal plant.

BEAN shipments continued to be made from the bonded warehouse established by the cooperative association at Fruita, Grand Valley project, Colo. The association pools all produce for the entire season and the range of prices for the crop has been from \$4.80 to \$6.70 per hundred. An advance of $2\frac{1}{2}$ cents per pound was made to the growers, and it is anticipated that another payment of 1 cent per pound will be made shortly.

TWO carloads of big mules were purchased recently from farmers on the Minidoka project and shipped to Loveland, Colo. They were pronounced the highest class mules ever shipped from this locality. Missouri papers please note.

ANEW highway bridge has been constructed across Snake River between Heyburn and Burley, Minidoka project. It is a substantial timber structure, supported on creosoted pile trestles. The floor is built of 2 by 6 inch lumber set on edge and carried on 6 by 20 inch Douglas fir stringers. A $\frac{3}{4}$ -inch wearing surface of gravel-bitumen will be placed upon the floor. There are now five highway bridges across Snake River within the project, and a sixth structure is proposed at Frenchman's Island, a few miles above the Heyburn bridge.

THE organization of a potato growers' association on the Milk River project has been completed, to cooperate with the State organization in the improvement of certified-seed marketing.

PLANS are being made by the Utah-Idaho Sugar Company to install a pulp press in connection with the Chinook plant, Milk River project, in order that the beet growers in localities remote from the factory may have the benefit of pulp for stock feeding.

THE Burley sugar factory of the Amalgamated Sugar Co., on the Minidoka project, has won a pennant and bronze tablet for having been the most economically operated of the company's plants in 1927. The Amalgamated Company has agreed to operate the Paul factory provided that not less than 3,000 acres of beets, with an estimated yield of 33,000 tons are contracted on the project north of Snake River.

A HOLDING company on the Yuma project, affiliated with one of the local banks, has planted a 160-acre unit in the valley division to paper-shell pecan trees, and is offering the land for sale in 1 to 10 acre blocks. It is the purpose of this company to plant 1,000 acres to trees as fast as nursery stock may be obtained. The company takes care of the land for the first six years and turns the land over to the purchaser in bearing trees.

THE season's picking of grapefruit on Unit B, Yuma Mesa, resulted in a yield of about 8,000 field boxes, the picking, packing, and shipping being handled by the Imperial Valley Grapefruit Growers' Association.

COLLECTIONS made by the Tieton Water Users' Association, Yakima project, for the month of February totaled \$15,432.67, compared with \$8,004.19 for the same month in 1927.

THE Castberg Creamery, Shoshone project, manufactured 10,060 pounds of butter and 160 gallons of ice cream during the month.

THE Great Western Sugar Co. has announced the 1928 price of sugar beets on the Shoshone project as \$7.50 per ton, with possible additional payments based on the sugar content and the price of sugar.

Economic Notes from the Reclamation Projects

Settlement and Development Problems of the Milk River, Sun River, and Lower Yellowstone Irrigation Projects, Montana

By F. B. Linfield, President, Montana Agricultural College, Bozeman, Mont.

IN considering what should be done with the Milk River, Sun River and Lower Yellowstone irrigation projects in Montana, it must be realized that we are not dealing with the problem of whether these projects should have been built in the first place. The conditions with which we in Montana must deal arise from the facts (1) that most of the engineering works have already been constructed at considerable expenditure of public funds; (2) that the projects are partly settled by people who have come with the promise of completed development and we are under certain obligations to assist them in making needed adjustments either by establishing themselves on a permanently prosperous basis or moving to more favorable locations; and (3) the land being partly settled the ditches have to be maintained and cared for but the limited use of water makes a very heavy overhead for these users.

Since the Federal Government is already heavily involved in the reclamation projects it is evident that there are two alternatives from which to choose in planning the future policy. The first alternative would be to close the projects with consequent loss of the money already invested. The second course would be to invest sufficient funds in addition to engineering enterprises to increase the area farmed and thus the gross yield so that the maintenance cost per unit farmed may be reduced.

If the first alternative is chosen, we may as well face the situation squarely, acknowledge complete failure of these large and important reclamation systems, and assist enough of the present settlers to move off so that the remaining ones may adjust themselves to nonirrigated farming.

POTENTIAL SUCCESS

Those of us who are familiar with existing conditions, however, are firmly convinced, as a result of studies already completed, that with the investment of a relatively small amount of capital, these projects can be settled in a successful manner and that the Government will then be able to recover the moneys expended from engineering construction.

The studies of the Montana Experiment Station show that settlement and development of irrigated areas are now entirely different from what it was at the

time the reclamation act was passed. In the first place, the old self sufficing pioneer conditions are over. It is no longer possible for a farmer to eke out an existence on a farm which produces most necessities of life and attain economic independence in the course of time through a rise of land values. With land values already as high as they can reasonably be expected to go for several years, the farm must now be something more than a source of subsistence. It must be a commercial enterprise, producing commodities which can be sold on national markets and produced at costs which will return interest on the investment and profits to the operator.

In the second place, opportunities in other fields appear more attractive than farming, so that people who move from agricultural districts seek urban employment to a much greater extent than was true before the agricultural depression. Thus, conditions must be such that prospective settlers can be as sure of financial success on the irrigated projects as they are in other business in which they might engage, before they will consider moving to these irrigated projects.

From the studies of the Montana Experiment Station information has been secured which will show (1) Whether or not farming can be profitably followed on the projects we are considering, (2) the types of farming most likely to succeed, and (3) the extent to which the total national production would be increased by complete development of the projects.

FARMING PROFITABLE

In answer to the question, "Can farming be profitably followed on the irrigated projects of northern Montana?" let me refer to an economic survey of the Milk River project. In the summer of 1927 a representative of the experiment station interviewed a group of successful farmers with the purpose of obtaining a record of their personal history and experiences, the types of farming in which they were engaged, and the financial progress they have made. Fifteen out of twenty farmers from whom complete records were obtained have made enough money farming on that irrigated project to accumulate property and financial reserves as a result of their farming operations. The average labor income from this group of 20 successful farmers was \$2,600 in 1926. This

represents the returns to the operator's labor after cash expenses, depreciation, and interest at 6 per cent on the capital investment have been deducted from the gross incomes. From the results of detailed soil surveys it has been estimated that 40 per cent of the land on the Milk River project and 75 per cent of the land on the Greenfields division of the Sun River project is suitable for a type of farming that will yield such returns from 80 to 160 acre farms. It is thought that 90 per cent of the land in the lower Yellowstone project would come under this classification.

By way of comparison we can refer to the Yellowstone Valley where irrigated farming has been carried on successfully for a long period of years and where the irrigated lands are completely settled. In 1924 a similar analysis of 17 of the most profitable farms in the Yellowstone region showed an average labor income of \$2,780, which is not much higher than what the successful Milk River farmers obtained. The average profitability of all farms in the Milk River Valley, however, is much lower than in the Upper Yellowstone Valley because of (1) a larger percentage of poor soil and (2) retarded settlement and development.

Since it is possible to find such successful farmers operating in the Milk River Valley, we feel safe in concluding that others could also succeed if they were properly educated along the lines of correct farming methods and were properly financed to secure the buildings and equipment necessary.

SUCCESSFUL TYPES OF FARMING

The second question that can be answered from our studies is "What types of farming are most likely to succeed on these irrigated projects?" In addition to interviews of successful farmers, economic conferences have been held to secure an agreement between farmers, business men and development agents as to the types of farming that can be recommended on the Milk River and Sun River projects. It was agreed by the farmers present at these conferences that for land lying within 6 miles of a railroad, sugar beet farming is the most profitable type. A typical sugar-beet farm adapted to the region would have about 80 acres and would roughly be divided so that one-fourth of the land

would be planted to sugar beets, one-fourth to small grains and one-half to alfalfa and pasture. The three alternatives from which to choose in placing livestock on such a farm are (1) beef cattle, (2) sheep, either as feeders or farm flocks and (3) dairying and hogs. It is estimated that with complete development 60 per cent of all the land on the Sun River, Milk River and lower Yellowstone projects would be devoted to this type of farming.

On lands lying beyond the 6-mile limit, or where the soil is not suitable for intensive beet farming, more extensified types of farming are necessary. Weed control where sugar beets and other intertilled crops can not be raised must be accomplished by raising alfalfa, sweet clover, and other legumes and occasional summer tillage which necessitates a certain portion of the ground lying idle for one season. It has been suggested, therefore, by these conferences of farmers, that on the outlying portions of irrigated districts, the farms should be 160 acres in size and should have one-third of the land in small grains and two-thirds in hay, pasture, or fallow. The livestock enterprises on such farms would be the same as on the more intensified beet farms.

SURPLUS NOT AFFECTED

The third question that we should attempt to answer is "To what extent will the total agricultural production be increased by the complete settlement of these projects"? According to figures given out by the Commissioner of Reclamation, the total area requiring settlement on the Milk River, lower Yellowstone, and Greenfields division of the Sun River projects is 160,370 acres. About 2,000 additional farmers are needed to divide this area into 80-acre units.

Assuming that this 160,000 acres contains a lower percentage of good beet land within 6 miles of the railroads than the remainder of the projects, we have roughly estimated that 85,000 acres could be used for beet farming and 75,000 acres for grain and stock farming. This division would result in the importation of about 1,060 farmers operating 80-acre units and 470 farmers operating 160-acre units.

It must be remembered that a good portion of the land which we refer to as requiring settlement, is not entirely unproductive at present. Large native blue joint meadows are used for hay and pasture and small grains are already grown on portions of this "unsettled" area.

Assuming that there is no production from such lands at the present time and that the entire 160,000 acres are brought

under cultivation by 1,500 farmers following recommended cultural methods and business practices, the largest increase we could possibly expect in the production of the major crop and livestock enterprises would be as follows:

Item	Increase of production expected if 160,000 acres of irrigable land are brought into intensive cultivation	Per cent of national production 1927
Wheat.....bushels..	1,087,500	0.1
Flax (first year only)...do....	640,000	2.4
Sugar beets.....tons..	212,500	3.0
Beef cattle.....head..	12,500	.03
Sheep.....do.....	38,000	.1
Hogs.....do.....	16,500	.03
Butter.....pounds..	1,280,000	.1

Hence sugar beets and flax are the only commodities in which the increase in the irrigated districts would exceed one-tenth

of 1 per cent of the total national production, and both of these are on an import basis.

From these estimates we should feel safe in predicting that increasing the efficiency of these irrigated projects would have no effect whatever upon the agricultural surplus.

MORE SETTLERS NEEDED

On the other hand, if a project is not fully occupied it means that settlers on one-third of the land must pay for the construction on the whole. This amounts substantially to confiscating the property of the present settlers to take care of overhead construction costs. Furthermore, we are faced with an ethical problem of keeping faith with the beet-sugar companies which have built factories in good faith with the understanding that enough settlers would be brought into the region to keep them operating to capacity.



A fine field of sugar beets on the Milk River project Mont.

With knowledge that the productiveness of the land is adequate for profitable farming and with moral responsibility to the settlers and industries already established, the college of agriculture feels justified in going to considerable length to assist new settlers to become established. The responsibility of securing these new settlers lies with the Bureau of Reclamation and railroad colonization departments. As a result of our studies and conferences, however, we have found that the most serious obstacle to proper development of the projects is lack of proper credit facilities. Settlers lack necessary funds to build houses, clear, level, and ditch raw land, buy necessary implements and livestock and pay living expenses until the first harvest. Local banks are operated as deposit agencies whose resources are needed to finance current stock and livestock enterprises. Their assets must be kept liquid and can not be tied up in real estate investments.

Local merchants can usually furnish sufficient credit for livestock and equipment to put in the first year's crop, but credit for real estate improvements must come from outside the local community.

Much of the land, especially on the Milk River project, is held in large tracts, varying in size from 160 to 1,500 acres. Such tracts have only one set of buildings, sometimes occupied by the owner and sometimes uninhabited and in a run-down

condition. Many owners of such farms desire to subdivide them into smaller units but, although they are willing to sell their land at reasonable rates, they lack capital to provide the necessary buildings.

Regular loaning agencies, such as trust and mortgage companies and the Federal land banks, are not loaning money in Montana at present. This is not due to the poor character of the security which might be offered, but to the fact that the Government already has first lien on the land for construction costs. Few agencies in any region would consent to loaning money for real estate improvements on the security of a second mortgage on unimproved land.

FINANCIAL AID NECESSARY

Since local agencies and landowners do not have sufficient capital to finance the further development of these partly settled areas and since the Federal Government already has a considerable investment at stake, we believe that the best way out of the difficulty would be for the Government to appropriate sufficient funds to put houses on the unoccupied tracts. Sufficient machinery is already present in the Bureau of Reclamation to administer such a type of credit and local owners would be willing to give full cooperation to such a venture. These houses

need not be very elaborate, and the prospective settler should be required to supply the labor to build them. The cost of materials for suitable house and barn would not exceed \$800 under such circumstances. As a precautionary measure, in the light of construction costs and other overhead charges on the land, we suggest that the owner should be willing to sell at a price not above the value of the land for dry-farming purposes.

If such a credit system can be satisfactorily arranged by the Bureau of Reclamation, the Montana State College is prepared to follow up the work already commenced in developing farming methods suited to the region. The economic conferences held last fall recommended certain standard practices and farm organization systems. It is proposed to secure the cooperation of a number of farmers who desire to adopt more profitable farming methods. These farms will be put under the supervision of an experienced irrigated-farm manager, who will have full authority to plan farm organizations and direct cultural practices. The aim will be to have each farm, so directed, develop into a standard type within three or five years. Such farms will be used as object lessons for their neighbors and guides for new settlers who are endeavoring to adapt themselves to the region.

Land Settlement on the Belle Fourche Project, South Dakota

By Otto C. Batch, Associate Reclamation Economist

THE Belle Fourche project, developed in the center of one of the largest livestock sections of the West, was opened at the beginning of one of the greatest land movements this country has had. As a result, it found itself populated by a small number of resident stockmen, whose original holdings were included in the area placed under irrigation, and a large number of homesteaders, many of whom were not qualified to farm in an irrigated section. Many homesteaders filed on claims because the land was free. Some thought a large profit could be made by selling out after patent was issued. At the beginning of the period of agricultural inflation, speculation ran riot. When the slump came, a veritable panic resulted, with every one running for cover and very few attempting to meet their contract obligations. In the final analysis, ownership, outside of the original established livestock men, became scattered over almost the entire United States; only a

small per cent of the irrigable area was cultivated by resident owners and over 50 per cent of the land idle. In 1925, through the concerted action of those who were vitally interested in the welfare of the project, a plan of readjustment came into existence on an economic basis commensurate with the ability of the project to reestablish itself. A part of this plan provides for the resettlement of the vacant lands with resident farmer-owners; the successful consummation of this resettlement program is the chief problem confronting this project at present.

Land settlement on the Belle Fourche project, under the present plan, had its inception in the fall of 1926 when 95 farms were placed under option agreements of sale, with prices fixed by an independent appraisal and on long terms of purchase. The initial payment is 10 per cent of the purchase price with the balance spread over a period of 20 years on the amortization plan. At the present

time (February 15, 1928) 11 of the listed farms with buildings have been sold and 6 farms sold with either no improvements or buildings of little use or value..

MORE BUILDINGS NECESSARY

With the need for buildings on the unoccupied project farms so apparent, an effort was made in the late spring of 1927 to enlist the owners of such unimproved land to place improvements on their farms. A questionnaire stating the need for improvements, either new buildings or repairs to existing buildings, was sent to 158 owners of choice unoccupied farms. As a result of this solicitation, 3 new houses were erected during the remainder of the year; 2 favorable replies were received provided some means could be secured to finance the building, while of the remaining 153, only 29 returned the questionnaire, with only 4 favorable to building, and then only when the situa-

tion demanded. If the results obtained are indicative of the ability of the landowner to add improvements unassisted, the development of the project, both agriculturally as well as industrially, will be so slow that its full development will be delayed many years. The prospective purchasers who visited the project in 1927, with hardly an exception, were adverse to considering the unimproved farm. This is well illustrated in the case of a man from Iowa who came to the project with a very definite location in mind; a farm on the edge of the project with some dry land pasture and access to outside range, in the vicinity of one of our successful sheep farms. The farm he finally selected and purchased does not meet with any of his original requirements, although there were listed farms in the neighborhood specified. Why? Because the farm he did select had a complete set of buildings and all the requirements for the establishment of a stock farm, while the land we were able to show in the vicinity specified had nothing to offer in the way of buildings and farm development which were regarded by him as essential to his success. The lack of buildings is felt more keenly in the farms available for tenancy. The rate of sales of land on the Belle Fourche is indicative of the need, at least for the next few years, for more tenant farmers. The present supply of available farms, farms with livable buildings, will not begin to meet the demand for rentals. With the new sugar factory in operation, a new class of farmers has come to the project and will continue to come if we can provide places for them. I refer to beet tenants from other districts who, as a class, are hesitant to purchase land and only do so when they are fully convinced that the farm will grow good beet crops.

The slogan of the Belle Fourche superintendent of the Utah-Idaho Sugar Co. is "a set of buildings on every 80 acres and every farm a beet farm." He has stated that, whenever conditions justify it, the Utah-Idaho Co. will erect another factory on the Belle Fourche project. With a second factory in operation it means that sugar beets, as a cash crop, must supplant grain and the production of livestock on many of the farms on the heavier soils supplemented with diversification, with sugar beets as a part of the crop rotation. The establishment of a second sugar factory will be an incentive for the further expansion of the dairy and stock feeding activities. To grow sugar beets profitably high yields must be maintained and high yields require fertile soil. The cheapest and in fact, the only fertilizer required on the Belle Fourche project, is barnyard manure; the farm with a maximum livestock population will be the farm that continues to be profitable. With the

time for payment of construction costs in addition to operation and maintenance charges approaching, production on all land on the project must be increased over its present average in order to meet this added tax.

A TYPICAL ILLUSTRATION

To meet industrial expansion more farmers are needed, and more farmers on the Belle Fourche project reverts back to the question of more buildings. And again we are confronted with the question as to who is to furnish the credit to provide the new improvements. The new farmers are chiefly tenant farmers who desire farm ownership and a permanent home. We are drawing farmers from a class least able financially to provide these necessary improvements and, at the same time, meet payments on land purchase and for other development. The capital required to complete the development of a typical unimproved farm on the Belle Fourche project is illustrated in the estimated expense in connection with one farm listed in the booklet. It is described as: 80 acres, 69 irrigable, 35 in cultivation, balance mostly low draw and raw irrigable land; clay soil, somewhat rolling; woven-wire fence in fair condition; two-room cabin; on school bus route; 4 miles to Newell; price \$3,000, deposit \$300, semiannual payments \$123.66. The house is not fit to live in, is not properly located with respect to the tillable land, would not lend itself to enlargement, and is considered valuable only as a beet laborer's house. To develop this farm as a dairy or stock farm, with sugar beets as a part of the cropping system, would require the following capital for the first year's operations:

Initial land payment.....	\$300.00
Operation and maintenance, at \$1.60 (69 acres).....	110.40
General taxes.....	86.25
Interest (6 months, at 6 per cent on \$2,700)....	81.00
Farm equipment.....	935.00
(Includes beet cultivator, beet lifter, wagon gear, plow, disk, harrow, drill, mower, rake, and cream separator.)	
Beet hand labor (for 10 acres).....	240.00
Seed.....	70.00
Feed for stock.....	125.00
Living expenses to harvest.....	250.00
(To be supplemented by income from cows.)	
Horses (4 head, at \$125).....	500.00
Dairy cows (5 head, at \$100).....	500.00
Poultry.....	75.00
Brood sow.....	25.00
Buildings:	
4-room house.....	1,250.00
Repairs to cabin.....	75.00
Sheds and outbuildings.....	600.00
Total capital required.....	
Building requirements.....	1,925.00
Working capital.....	3,297.65

Local credit would take care of the financing of the beet hand labor and possibly living expenses with aid of income from dairy cows. The purchase of the cows could be handled through the Agricultural Credit Corporation. The balance of the financing must come either through actual possession of cash or through the cooperation of some outside agency with available funds on long-term loans at a moderate rate of interest. The providing of such a credit fund is the chief need of this project to increase its earning power and assure settlement and prosperity.

"We are highly pleased with the New RECLAMATION ERA. It gets better every year. We prize it the highest of any of our Western farm papers."—Arthur Gurley, Selah, Wash.



An acre plat of cucumbers

Financing Irrigated Farms

Editorial appearing in the February 23, 1928, issue of the Morning Oregonian

HAVING put water on arid land, the Government has only half finished the work of reclamation. In order to complete that work it should level, fence, and prepare the land for cultivation, build house and barn, select an experienced farmer to cultivate the farm—one who has at least \$2,000 capital—make him a long-time loan of half the needed capital, provide expert advice on crops and cultivation, and organize settlers on each project into a cooperative association. Such is the substance of the conclusions reached by the reclamation conference at Washington, and of several bills introduced in Congress with approval of the conference, authorizing use of the reclamation fund as proposed.

That plan is a radical departure from the public land-policy under which the West was settled by the pioneers, when the Government provided the land and the settler and his family provided everything else; but the agricultural public land has all been brought under cultivation, and the man who wants a farm can buy one ready-made. That plan is also a decided departure from the original reclamation law, which authorized reclamation of public land and its sale to any person who established often a merely nominal residence and paid the annual water charges. Experience proved that some persons "settled" as a speculation, rented irrigated farms at high rates, and lived in adjoining towns, that renters usually failed to pay the Government's charges, and that there

were far from enough actual settlers to occupy an entire project. The investment in reclamation was not returned to the Government, and the reclamation fund revolved more slowly year by year with a prospect that it would stop.

Commissioner Mead takes the practical view that the work of reclamation is not completed until every farm on a project is occupied by a qualified farmer, equipped with all requisites for his industry and producing from the soil the money that will pay for land, reclamation, and loans for equipping the farm. On several projects already reclaimed but only partly settled, the Government can get its money out only by putting more in, either by preparing farms for settlement or by loans to settlers. The proportion of private to public land that is included in a project has increased to half and sometimes more, and it is proposed that the Government buy this land at its unreclaimed value and sell it to selected settlers.

By going so far in order to make arid land produce, the Government practices paternalism to a degree that will arouse serious objection from those who pin their faith to individualism as the chief source of American progress. But the Government has gone so far that its only way out is through—by getting the land under production by farmers in the one way by which they can be induced to settle. Doctor Mead estimates that from \$5,000 to \$7,000 are necessary to establish a farmer in a home and to start him at

farming. An experienced farmer with that much capital can buy a ready-made farm in a well-settled community with all the conveniences of civilization at hand. He must be offered something at least as good in order to be attracted to an irrigated farm. The attractions are high fertility of the soil and certainty of crops, independent of the whims of weather. Other things being equal, irrigated farms should draw buyers, and the plan is to make other things equal.

Other means have been proposed to obtain loans to start settlers farming, but all encounter obstacles. The States have been asked to cooperate by selecting and financing settlers, but they have not responded. Oregon spent much money in paying interest on irrigation district bonds, and is giving its officials much mental labor on schemes to get its money back. All the Western States are making large investments on highways and, with large parts of their area exempt from taxation because it is in the public domain, they are not disposed to assume new liabilities. Private finance companies have been proposed, but they do not enter the field, probably because the best security for loans that they could obtain would be mortgages second to the Government's claim for reclamation. Federal farm land banks make loans only on farms already improved; therefore are barred from this field. It should be practicable, however, for the Reclamation Bureau after a farm is producing to combine its loan with the water charge, to transfer its mortgage to the farm land bank and to get its money back, while the farmer would continue payments through 36 years on the amortization plan.

The end in view is to bring the whole area of a reclaimed tract under cultivation as soon as possible after water is on the land, and out of the produce to secure regular repayment in annual installments of the total cost of reclamation. It would be better to invest more in preparing land for settlers and in financing them than to permit projects to remain half settled by men whose burdens are increased by failure to settle the other half. The plan now recommended, if carefully worked, should keep the reclamation fund revolving at the full speed of the 40-year-payment plan, which means more reclamation as long as the supply of feasible projects lasts. The Government's profit will consist in the amount of internal taxes paid by thousands of prosperous farmers and by the towns they would support in regions of which the sole products have been sagebrush and greasewood.



Sugar-beet factory on the North Platte project, Nebraska-Wyoming

Appropriations for the Bureau of Reclamation for the Fiscal Year Ending June 30, 1929

Act approved March 7, 1928

THE following sums are appropriated out of the special fund in the Treasury of the United States created by the act of June 17, 1902, and therein designated "the reclamation fund," to be available immediately:

Commissioner of Reclamation, \$10,000; and other personal services in the District of Columbia in accordance with "the Classification Act of 1923," \$135,000; for office expenses in the District of Columbia, \$23,000; in all, \$168,000;

For expenses, except membership fees, of attendance upon meetings of technical and professional societies required in connection with official work of the bureau, \$2,000;

For all expenditures authorized by the act of June 17, 1902 (Thirty-second Statutes, page 388), and acts amendatory thereof or supplementary thereto, known as the reclamation law, and all other acts under which expenditures from said fund are authorized, including not to exceed \$165,000 for personal services and \$30,000 for other expenses in the office of the Chief Engineer, \$25,000 for telegraph, telephone, and other communication service, \$8,000 for photographing and making photographic prints, \$50,000 for personal services, and \$13,000 for other expenses in the field legal offices; examination of estimates for appropriations in the field; refunds of overcollections and deposits for other purposes; not to exceed \$20,000 for lithographing, engraving, printing, and binding; purchase of ice; purchase of rubber boots for official use by employees; maintenance and operation of horse-drawn and motor-propelled passenger-carrying vehicles; not to exceed \$40,000 for purchase of horse-drawn and motor-propelled passenger-carrying vehicles; packing, crating, and transportation (including drayage) of personal effects of employees upon permanent change of station, under regulations to be prescribed by the Secretary of the Interior; payment of damages caused to the owners of lands or other private property of any kind by reason of the operations of the United States, its officers or employees, in the survey, construction, operation, or maintenance of irrigation works, and which may be compromised by agreement between the claimant and the Secretary of the Interior, or such officers as he may designate; payment for official telephone service in the field hereafter incurred in case of official telephones installed in

private houses when authorized under regulations established by the Secretary of the Interior: *Provided*, That no part of said appropriations may be used for maintenance of headquarters for the Bureau of Reclamation outside the District of Columbia except for an office for the chief engineer and staff and for certain field officers of the division of reclamation economics: *Provided further*, That the Secretary of the Interior in his administration of the Bureau of Reclamation is authorized to contract for medical attention and service for employees and to make necessary pay-roll deductions agreed to by the employees therefor: *Provided further*, That no part of any sum provided for in this act for operation and maintenance of any project or division of a project by the Bureau of Reclamation shall be used for the irrigation of any lands within the boundaries of an irrigation district which has contracted with the Bureau of Reclamation and which is in arrears for more than twelve months in the payment of any charges due the United States, and no part of any sum provided for in this act for such purpose shall be used for the irrigation of any lands which have contracted with the Bureau of Reclamation and which are in arrears for more than twelve months in the payment of any charges due from said lands to the United States;

Examination and inspection of projects: For examination of accounts and inspection of the works of various projects and divisions of projects operated and maintained by irrigation districts or water-users' associations, the unexpended balance of the appropriation for these purposes for the fiscal year 1928 is reappropriated for the same purposes for the fiscal year 1929;

For operation and maintenance of the reserved works of a project or division of a project when irrigation districts, water-users' associations, or Warren Act contractors have contracted to pay in advance but have failed to pay their proportionate share of the cost of such operation and maintenance, to be expended under regulations to be prescribed by the Secretary of the Interior, \$75,000.

Yuma project, Arizona-California: For operation and maintenance, \$255,000; for continuation of construction of drainage, \$20,000; for continuation of construction of protective works at Picacho and unnamed washes, \$30,000; in all,

\$305,000: *Provided*, That of the unexpended balance of the appropriation of \$200,000 for the Yuma auxiliary project, contained in the second deficiency act, fiscal year 1925 (Forty-third Statutes at Large, page 1330), \$35,000 is hereby made available for the same purposes for the fiscal year 1929: *Provided further*, That not to exceed \$25,000 from the power revenues shall be available during the fiscal year 1929 for the operation and maintenance of the commercial system;

Orland project, California: For operation and maintenance, \$36,000: *Provided*, That the unexpended balance of the appropriation of \$605,000 for construction of Stony Gorge Reservoir, contained in the act making appropriations for the Department of the Interior for the fiscal year 1928 (Forty-fourth Statutes at Large, page 934), shall remain available for the fiscal year 1929 for completion of construction;

Grand Valley project, Colorado: For operation and maintenance, \$50,000; continuation of construction, \$25,000; in all, \$75,000;

Boise project, Idaho: For continuation of construction, Payette division, \$400,000: *Provided*, That of the unexpended balance of the appropriation for this project for the fiscal year 1927 there is reappropriated for operation and maintenance, Payette division, \$17,000; for investigations, examination and surveys, Payette division, \$18,000; for continuation of construction, Arrowrock and Payette divisions, \$75,000;

Minidoka project, Idaho: For operation and maintenance, reserved works, \$29,000; continuation of construction, \$1,075,000: *Provided*, That not to exceed \$50,000 from the power revenues shall be available during the fiscal year 1929, for the operation of the commercial system; in all, \$1,104,000;

Minidoka project, American Falls Reservoir, Idaho: For operation and maintenance, American Falls water system, \$12,000; for acquiring rights of way, \$5,000; construction of power plant, \$550,000; in all, \$567,000: *Provided*, That the unexpended balance of \$700,000 for construction of power plant, contained in the act making appropriations for the Department of the Interior for the fiscal year 1928 (Forty-fourth Statutes at Large, page 934), shall remain available for the same purpose for the fiscal year 1929;

Milk River project, Montana: For operation and maintenance, \$27,000;

continuation of construction, \$17,000; in all, \$44,000;

Sun River project, Montana: For operation and maintenance, \$19,500; continuation of construction, \$1,139,500; in all, \$1,159,000: *Provided*, That not to exceed \$25,000 of the appropriation for continuation of construction, Greenfields division, contained in the act of January 12, 1927 (Forty-fourth Statutes at Large, page 934), shall remain available for drainage construction Greenfields division until June 30, 1929;

Lower Yellowstone project, Montana-North Dakota: For continuation of construction of drainage system, \$180,000;

North Platte project, Nebraska-Wyoming: Not to exceed \$75,000 from the power revenues shall be available during the fiscal year 1929 for the operation and maintenance of the commercial system;

Newlands project, Nevada: Not to exceed \$100,000 of the appropriation of \$125,000 for operation and maintenance contained in the act making appropriations for the Department of the Interior for the fiscal year 1928 (Forty-fourth Statutes, page 934), is hereby made available until June 30, 1929, for the reconstruction of the Truckee Canal;

Carlsbad project, New Mexico: For operation and maintenance, \$50,000;

Rio Grande project, New Mexico-Texas: For operation and maintenance, \$350,000; continuation of construction, \$80,000; in all, \$430,000: *Provided*, That the unexpended balance of the appropriation of \$400,000 for continuation of construction, contained in the act making appropriations for the Department of the Interior for the fiscal year 1928 (Forty-fourth Statutes at Large, page 934), shall remain available for the same purposes for the fiscal year 1929;

Owyhee project, Oregon: For continuation of construction, \$2,000,000;

Umatilla project, Oregon: For operation and maintenance of reserved works, \$5,000 of the unexpended balance of the appropriation for this project for the fiscal year 1927 shall be available for the fiscal year 1929, and the remainder of said unexpended balance shall be turned back to the reclamation fund upon the approval of this act;

Baker project, Oregon: The unexpended balance of the appropriation for this project for the fiscal year 1928 is reappropriated and made available for the same purpose for the fiscal year 1929;

Vale project, Oregon: For operation and maintenance, \$6,000; continuation of construction, \$744,000, of which amount not more than \$150,000 shall be available for the purchase of a proportionate interest in the existing storage reservoir of

the Warm Springs project; in all, \$750,000;

Klamath project, Oregon-California: For operation and maintenance, \$35,000; continuation of construction, \$206,000; for refunds to lessees of marginal lands, Tule Lake, which lands because of flooding could not be seeded prior to June 1, 1927, and/or June 1, 1928, \$30,000; in all, \$271,000;

Belle Fourche project, South Dakota: For continuation of construction, \$250,000;

Salt Lake Basin project, Utah, first division: For construction of Echo Reservoir and Weber-Provo Canal, \$1,750,000;

Yakima project, Washington: For operation and maintenance, \$288,000; continuation of construction, \$500,000; in all, \$788,000;

Yakima project (Kittitas division), Washington: For continuation of construction and operation and maintenance, \$1,500,000: *Provided*, That the unexpended balance of the appropriation of \$2,000,000 contained in the act making appropriations for the Department of the Interior for the fiscal year 1928 (Forty-fourth Statutes at Large, page 934), shall remain available during the fiscal year 1929;

Riverton project, Wyoming: For operation and maintenance, \$30,000; continuation of construction under force account, \$400,000, together with the unexpended balance of the appropriation for this purpose for the fiscal year 1926, which is hereby reappropriated: *Provided*, That not to exceed \$20,000 from the power revenues shall be available during the fiscal year 1929 for the operation and maintenance of the commercial system; in all, \$430,000;

Shoshone project, Wyoming: For continuation of construction of drainage, Garland division, \$115,000; Frannie division, \$20,000; Willwood division, \$25,000; in all, \$160,000: *Provided*, That of the unexpended balance of the appropriation for this project for the fiscal year 1927 there is reappropriated for operation and maintenance of the Frannie division, \$11,000; and of the Willwood division, \$10,000; in all, \$21,000: *Provided further*, That not to exceed \$20,000 from the power revenues shall be available during the fiscal year 1929 for the operation and maintenance of the commercial system;

Secondary projects: For cooperative and general investigations, \$75,000;

For investigations necessary to determine the economic conditions and financial feasibility of new projects and for investigations and other activities relating to the reorganization, settlement of lands, and financial adjustments of existing projects, including examination of soils, classification of land, land-settlement activities,

including advertising in newspapers and other publications, and obtaining general economic and settlement data, \$75,000: *Provided*, That the expenditures from this appropriation for any reclamation project shall be considered as supplementary to the appropriation for that project and shall be accounted for and returned to the reclamation fund as other expenditures under the reclamation act;

Under the provisions of this act no greater sum shall be expended, nor shall the United States be obligated to expend during the fiscal year 1929, on any reclamation project appropriated for herein, an amount in excess of the sum herein appropriated therefor, nor shall the whole expenditures or obligations incurred for all of such projects for the fiscal year 1929 exceed the whole amount in the "reclamation fund" for the fiscal year;

Ten per centum of the foregoing amounts shall be available interchangeably for expenditures on the reclamation projects named; but not more than 10 per centum shall be added to the amount appropriated for any one of said projects, except that should existing works or the water supply for lands under cultivation be endangered by floods or other unusual conditions an amount sufficient to make necessary emergency repairs shall become available for expenditure by further transfer of appropriation from any of said projects upon approval of the Secretary of the Interior;

Whenever, during the fiscal year ending June 30, 1929, the Commissioner of the Bureau of Reclamation shall find that the expenses of travel, including the local transportation of employees to and from their homes to the places where they are engaged on construction or operation and maintenance work, can be reduced thereby, he may authorize the payment of not to exceed 3 cents per mile for a motor cycle or 7 cents per mile for an automobile used for necessary official business;

Total, from reclamation fund, \$12,644,000.

To defray the cost of operating and maintaining the Colorado River front work and levee system adjacent to the Yuma Federal irrigation project in Arizona and California, subject only to section 4 of the act entitled "An act authorizing the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," approved January 21, 1927 (Forty-fourth Statutes, page 1010), \$100,000, to be immediately available.

For investigations to be made by the Secretary of the Interior through the Bureau of Reclamation to obtain necessary information to determine how arid and

semiarid, swamp, and cut-over timberlands in any of the States of the United States may be best developed, as authorized by subsection R, section 4, second deficiency act, fiscal year 1924, approved December 5, 1924 (Forty-third Statutes, page 704), including the general objects of expenditure enumerated and permitted in the fourth paragraph in this act under the caption "Bureau of Reclamation," and including mileage for motor cycles and automobiles at the rates and under the conditions authorized herein in connection with the reclamation projects, \$15,000.

Reclamation Dams To Be Examined

Secretary Work is having all storage dams under the jurisdiction of the Interior Department on reclamation projects and on Indian reservations examined to determine their safety. Those that would endanger human life, if they were to break, are being examined first. There are some 50 storage reservoirs under the control of the Department of the Interior, located at various points in the West, which are used principally for irrigated agriculture, ranging from small capacity to as much as 2,600,000 acre-feet in the case of Elephant Butte Dam in New Mexico.

Appropriations available, fiscal year 1929 (act of March 7, 1928)

Project or office	Direct	Estimated unexpended balance	Estimated contributed funds	Power revenues	Total
From reclamation fund:					
Washington office.....	\$168,000				\$168,000
Attendance at technical and professional meetings.....	2,000				2,000
Examination and inspection of projects.....		\$15,000			15,000
Operation and maintenance of reserved works.....	75,000				75,000
Yuma.....	305,000			\$25,000	330,000
Yuma auxiliary.....		35,000			35,000
Orland.....	38,000	24,000			60,000
Grand Valley.....	75,000				75,000
Boise.....	400,000	75,000	\$35,000		510,000
Minidoka.....	1,104,000		80,000	50,000	1,234,000
Minidoka American Falls.....	567,000	700,000			1,267,000
Milk River.....	44,000		30,000		74,000
Sun River.....	1,150,000	25,000	10,000		1,194,000
Lower Yellowstone.....	180,000		70,000		250,000
North Platte.....			40,000	75,000	115,000
Newlands.....		100,000			100,000
Carlsbad.....	50,000				50,000
Rio Grande.....	430,000	150,000	150,000		730,000
Owyhee.....	2,000,000				2,000,000
Umatilla.....		5,000			5,000
Baker.....		440,000			440,000
Vale.....	750,000				750,000
Klamath.....	271,000		75,000		346,000
Belle Fourche.....	250,000		75,000		325,000
Salt Lake Basin.....	1,750,000				1,750,000
Yakima.....	788,000				788,000
Yakima-Kittitas division.....	1,500,000	350,000			1,850,000
Riverton.....	430,000	180,000		20,000	630,000
Shoshone.....	160,000	21,000	15,000	20,000	216,000
Secondary.....	75,000		20,000		95,000
Economic investments.....	75,000				75,000
Total.....	12,644,000	2,120,000	600,000	190,000	15,554,000
From General Treasury:					
Colorado River front work.....	100,000				100,000
Arid, semiarid, etc.....	15,000				15,000
Total.....	12,759,000	2,120,000	600,000	190,000	15,669,000

Elephant Butte District Makes Large Payment

Here is another instance of the ability of the water users on the Federal irrigation projects to meet their payments to the Government under the present con-

tracts. The Elephant Butte Irrigation District on the Rio Grande Federal irrigation project, New Mexico-Texas, has sent to the Bureau of Reclamation its check for \$133,470 as payment in full of the construction charges of the district due March 1, 1928, being one-half of the total yearly charges of \$266,940.



Money-makers when properly cared for



Reclamation Project Women and Their Interests

By Mac A. Schnurr, Secretary to the Commissioner and Associate Editor, New Reclamation Era



Don't Leave the Windows Curtainless All Summer

WITH a good many housekeepers it is the custom to take down every window curtain in the house at the period of spring cleaning. After they have been laundered the curtains are put away until fall cleaning or some other traditional date permits them to go up again. In the meantime the windows remain bare and unattractive and rooms lose their charm. They are filled with the unobscured glare of summer sunshine, which, while tempting in the first days of spring, is almost unbearable on hot days in many parts of the country. It helps to fade rugs and other furnishings. When privacy or subdued light is necessary the only course is to pull down the shades and incidentally to shut out most of the fresh air.

Curtains undoubtedly need cleaning from time to time, but this old-fashioned idea of housekeeping has given way to the more modern idea that it is not necessary to make our homes bare, uncomfortable, and ugly in order to have them clean. If the curtains used during the winter seem too elaborate or heavy for spring and summer, it would be a good plan to have a second set made of lighter, sheerer materials. They would be in harmony

with fresh slip covers and gay-colored decorations. They would serve every necessary purpose of curtains, retain softness and charm in each room, and add to its comfort. Side draperies, valances, and unnecessary trimming could well be omitted. As the hot summer sun fades many fabrics, these might be made of plain cream or white material or of some guaranteed fast-colored fabric. Draw curtains would be useful. They could be pulled back at night to permit the maximum circulation of air, and yet, when drawn, their texture would allow more air to penetrate into the room than a shade would.

When need for economy makes it impossible to have two sets of curtains, an all-year type of material can be selected that will stand the necessary wear and laundering required by double-duty curtains.

How to Make Curtains

Before you buy your material it is a wise precaution to draw to scale the window to be curtained. Use a yardstick

or folding ruler, as a tapeline may stretch, resulting in inaccurate measurements. Note the exact dimensions of the window on your drawing, and also the width of the trim and apron. Then sketch in lightly the kind of curtains you wish to have and decide whether or not they are suited to that type of window. If the window is very broad, you may not need a valance, since that emphasizes the horizontal lines; if the window is narrow and high, a valance and side draperies set far over at the edge of the trim will help to correct its proportions.

Let us assume that you are going to make glass curtains of scrim, marquisette, or net, with side draperies and a gathered valance of cretonne, unlined. They are to be shirred on a rod without a heading, as the valance hides the top of them. The measurement for their width is taken on the plan drawn to scale, on the part of the trim nearest the glass. Allow twice the width of the window in soft materials—almost two breadths, usually. They should be just long enough to escape the sill. Glass curtains may have hems from $1\frac{1}{2}$ to 3 inches wide at the front and lower edges, and one-fourth-inch hems on the outside. A common rule is to add 9 inches to the length of any finished curtain for hems, heading, and shrinkage, but since the glass curtains are to be run on rods through a easing at the top, without a heading, 2 inches less may be allowed.

Each curtain length should be measured and checked before any material is cut off. Before cutting, draw threads, if possible, to provide an accurate guide. Trim off all selvages and put in the side hems, then the top and bottom hems. They should all be turned under the depth of the hem. Otherwise, when light shines through the curtains, an irregular line is seen inside the hem. A tuck should be taken just below the casing to allow for shrinkage when the curtain is laundered. Hems look better when put in by hand rather than by machine stitching, and will not draw. If there are many curtains to be made, however, machine stitching is advisable.

Skimpy side draperies are not attractive. Cretonne is usually 36 inches wide and you will need a length the full width of material for each side. Fifty-inch material may sometimes be split lengthwise and finished with an extension hem.



Measure with care when making curtains

In estimating the length of the side draperies, measure from the top or middle of the upper trim to the bottom of the apron and add 9 inches for hems, casing, and shrinkage. If there is a decided pattern in the material, you must see that the pattern balances on each side before the material is cut. A little extra yardage may have to be allowed for matching patterns.

Measure and cut the side draperies with the same care as in making the glass curtains. Clip the selvages at intervals of 3 or 4 inches or trim them off. Turn a hem $1\frac{1}{2}$ inches on the lengthwise edges and a 2 or 3 inch hem at the bottom. Make a casing at the top for the rod to run through, since there is to be a valance.

The valance when finished is usually one-sixth of the length of the finished side draperies. Hem, heading, and casing allowances are added to this depth in calculating the material required. The length of the valance across the window is one and a half times the width of the window and side trim if the valance is gathered, twice that much if it is plaited. Make the valance in the same way as the curtains.

Three rods will be needed for hanging these curtains, since the valance and side draperies should not be hung on the same rod. The glass curtain must be set closer to the window than the other hangings. The neatness and general attractiveness of the finished curtains will depend on the way they are hung. Solid round rods which fit into sockets are desirable for glass curtains. Flat or round rods may be used for the overdraperies.

All curtains should be pressed when finished. Avoid making crosswise folds in them or any unnecessary lengthwise creases.

Curtains for a Casement

Casement windows, either single or in groups, are picturesque and appropriate in both large and small houses. If well made they are charming and convenient, but they must be curtained so as not to interfere with their opening.

The material of which the casement curtains are made is the same as that used for any other windows in the room, unless some special effect is desired. In a hall or alcove a casement may sometimes be treated as an entirely separate decorative feature. If the living room has both casements and double sash windows, the material chosen for curtains must be adapted to both types of window, and to the atmosphere of the living room, whether formal and dignified or informally gay and cheerful. Plain fabrics such as

poplin, pongee, rayon, silk and cotton mixtures, monk's cloth, heavy gauze, or casement cloth are good. Richly patterned cretonnes suit some living rooms if the walls are plain. They may be used as draw curtains for the casement and as side draperies for other windows.

If the casement opens out, there is less chance of the curtains being in the way of the sash. Draw curtains can be pulled back to the extreme edge of the window frame when the casement is opened. If glass curtains must be used they should be hung from the upper casing so that they remain inside the room when the casement is unfastened. Otherwise they would soon be spoiled by rain and outdoor air. Side draperies and draw curtains should end on a line with the apron or sill.

If the casement opens in, glass curtains may be shirred on rods at the top and bottom of the sash, or hung with rings from the top of it, so that they swing with the window. If a valance and side draperies are used with the opening-in casement, the valance must clear the top of the sash as it swings in. On the whole, draw curtains will be found best for casements. They are generally arranged in clusters of pleats on rings to be drawn back and forth on a solid rod by means of double cords passing over small pulleys. The illustration shows casement curtains of plain-colored pongee for the living room.

All eggs for hatching should be uniform in shape and size, sound in shell, and of good size. No eggs weighing less than 2 ounces should be used.



Curtains for a casement

The Guernsey Power Plant, North Platte Project, Nebraska-Wyoming

By H. F. McPhail, Engineer, Denver Office

THE Guernsey power plant is located on the North Platte River about $1\frac{1}{2}$ miles northwest of the town of Guernsey, Wyo., immediately below the Guernsey Dam. The dam is a sluiced gravel and rock fill structure approximately 105 feet high and 500 feet long and was constructed jointly to conserve and store water for irrigation purposes and to create a power head.

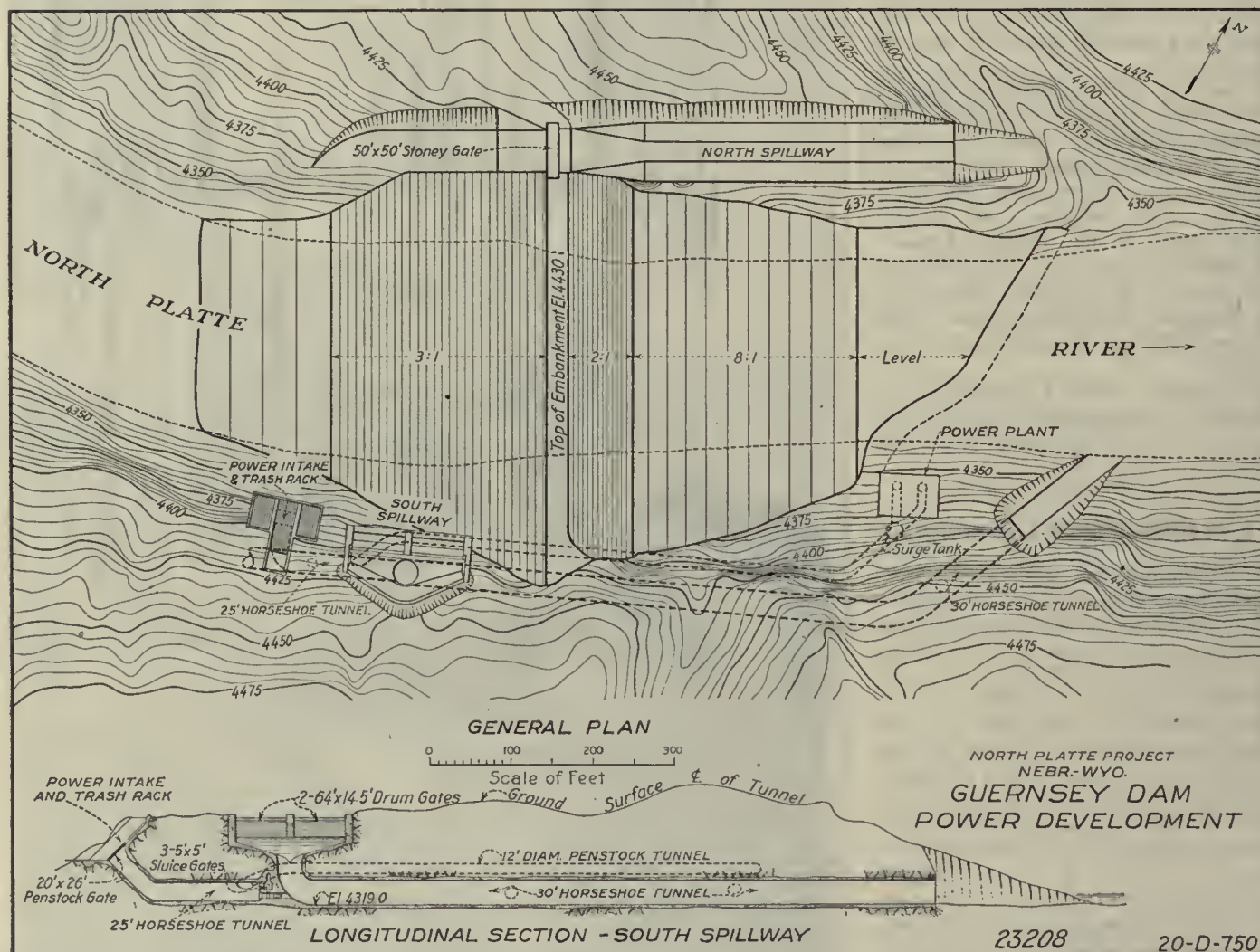
The power head available will vary from a minimum of approximately 40 feet to a maximum of 90 feet. The water surface on the upstream side of the dam is expected to vary about 40 feet and the tail-water elevation about 19 feet under normal conditions. Throughout the irrigation season there are available for power purposes 3,000 or more second-feet of water, but during the nonirrigation season the water is limited to the natural flow in the river plus such small amounts

as can be used without endangering the supply required for irrigation storage.

The plant is designed for the ultimate development of 12,000 kv.-a., but at present a power tunnel and a power plant building designed only for the development of 6,000 kv.-a. have been constructed. Two 3,000 kv.-a. hydroelectric units have been installed. Additional development will require the construction of a second power tunnel and an extension of the present building.

Power water is diverted from the Guernsey reservoir through a reinforced concrete inlet structure covered with a steel trash rack having a total area of approximately 5,000 square feet. The water is then led into a 20 by 15 foot rectangular concrete-lined tunnel, which is controlled by a 20 by 26 foot Stoney gate operating on a 45° slope. This gate is motor operated and can be closed from the

power plant in case of emergency. The 20 by 15 foot rectangular tunnel section after a short drop on a 45° slope enlarges to a 25-foot horseshoe section and joins the diversion tunnel originally built for the construction of the dam. The power water then passes through about 170 feet of the diversion tunnel to a point where the 12-foot diameter power tunnel starts, and it is contemplated in the ultimate development that a second power tunnel will take off at this same point. The diversion tunnel is plugged immediately below the point where the power tunnel starts and through the plug are three sluicing conduits each controlled by a 5 by 5 foot hydraulically operated sluice gate, which will permit sluicing of any silt accumulation in the large tunnel and which will also serve to discharge irrigation water if so desired.



The 12-foot circular tunnel is about 700 feet long and connects at its lower end with a plate steel penstock of the same diameter. This penstock divides into two 8 foot 6 inch diameter branches, one for each unit in the power plant. The penstock is anchored in the rock of the power tunnel and also by a large reinforced concrete anchor over the wye section where it branches. This latter anchor also serves to support the 22-foot diameter by 85-foot high steel surge tank.¹

At the end of each penstock, at the inlet of each turbine, is installed an 8-foot 6-inch motor-operated butterfly valve, which allows either unit to be inspected or repaired without interfering with the operation of the other. Each turbine is rated at 3,400 horsepower at 65 feet head and is of the vertical-shaft, single-runner, spiral-casing type, with the plate steel casing embedded in solid concrete. The first turbine was manufactured by the S. Morgan Smith Co. and the second by the Newport News Shipbuilding & Dry Dock Co. The normal speed is 240 r. p. m. Each unit is controlled by a Woodward oil-pressure type governor with motor-driven fly balls. Each governor is equipped with a control device which allows adjustment of the gate travel at high heads so as not to allow overloading the generator but still allowing full travel of the governor.

Each generator is supported above its turbine by a cast-iron pit liner surrounded

with reinforced concrete. The height is such as to place the top of the generator at about the elevation of the gallery floor of the plant and access to the exciters, which are direct-connected to and on top of the generators, is gained by a steel walkway from the gallery floor. Each generator is of the 2,300-volt, 3-phase, 60-cycle, vertical, water-wheel driven type having a capacity of 3,000 kilovolt-amperes, or 2,400 kilowatts at 80 per cent power factor. Each exciter has sufficient capacity to excite its own generator plus 10 per cent additional load. All electrical equipment in the plant was furnished by the General Electric Co.

THE POWER PLANT BUILDING

The power plant building is a reinforced concrete structure approximately 72½ feet long, 50 feet wide, and 77 feet high from bottom of foundation to top of walls. The east wall of the plant is composed of structural steel members covered with an inside and outside layer of metal lath and plaster and all of such a nature that it can be readily removed when it is desired to enlarge the installation. The main body of the plant consists of a single room running the entire length of the building and approximately 32 feet wide by 40 feet high, which houses the two generating units. At the elevation of the main floor of the building and extending away from the river are rooms 15 feet wide and of various lengths which provide for a machine shop, a storage room, an oil room, a storage-battery room, and a shower bath, toilet, and lavatory.

Immediately over these rooms and 12 feet above the main floor elevation is a galley containing the switchboard room, the 2,300-volt switch room, and the office. On the roof over these rooms is the 33,000-volt switching apparatus.

The voltage is raised from 2,300 33,000 volts by two banks of oil-insulated, self-cooled, outdoor-type, single-phase transformers of 1,000 kv.-a. capacity each, which with one spare unit, are installed immediately back of and at the same elevation as the switchboard gallery. By means of a transfer car these transformers can be interchanged or brought into the main building for repairs. Two outgoing 33,000-volt circuits leave the plant, each being controlled by a 37,000-volt oil circuit breaker with a third breaker installed for connecting them on the 33,000-volt side if desired. Each line is protected against lightning by an oxide film type, 33,000-volt arrester.

The main switchboard consists of nine panels and a swinging bracket. It contains all meters for measuring the various loads and all protective relays. All circuit breakers are controlled electrically from the main board. An auxiliary board of two panels placed behind the main board supports the generator field switches and high voltage relays. Light, power, and heat for the plant are all furnished from four 37½ kv.-a. transformers installed in the rear of the main switchboard. A 30-ton traveling crane with a motor-operated hoist for handling the machinery, a small air compressor for

¹ See article by R. E. Glover in the September, 1927, issue of the NEW RECLAMATION ERA, p. 136.



Guernsey Dam, North Platte project, Nebraska-Wyoming



Guernsey power house, North Platte project, Nebraska-Wyoming

general use around the plant, and a centrifugal oil purifier and dehydrator for conditioning transformer oil are also installed in the plant.

The entire development was built under contract by the Utah Construction Co., with F. T. Crowe, superintendent, in charge of the work for the contractor and F. F. Smith, resident engineer for the Bureau of Reclamation.

SALE OF POWER

The first unit of the plant was placed in service July 26, 1927, and has operated steadily since that time. The plant feeds into a power system covering all the territory adjacent to the North Platte River from Casper, Wyo., to Broadwater, Nebr., a distance of over 250 miles. Power is being sold at wholesale to the towns of Gering, Mitchell, Morrill, and Lyman, Nebr., and Torrington, Lingle, Fort Laramie, Guernsey, and Wheatland, Wyo.; to the Colorado Fuel & Iron Co. for use in connection with the operation of its iron mine at Sunrise, Wyo.; to the Mountain States Power Co. for distribution in the towns of Yoder, Douglas, and Casper, Wyo.; and to the Western Public Service Co. for distribution in Scottsbluff, Nebr., and other towns east of that point which are now served by this company.

One of the great troubles with the marketing of poultry in the United States is the excessive number of immature, scrawny chickens sent to market.

Sugar Beets Grown on Projects in 1927

Crop statistics recently compiled by the Bureau of Reclamation show that in 1927 sugar beets were grown on 65,288 acres on 13 Federal irrigation projects, producing 743,201 tons of beets, an average of 11.4 tons per acre. The crop was valued at \$5,842,980, or \$89.50 per acre.

More than half of the total acreage in sugar beets was on the North Platte project, Nebraska-Wyoming, where 35,220 acres were in this crop, producing 433,000 tons of beets, valued at \$3,410,000, or \$97 per acre. The highest yield per acre, amounting to 13.5 tons, was on the Minidoka project in Idaho. The highest value per acre on projects having at least 1,000 acres in the crop was on the Huntley project, Montana, amounting to \$108.

Statistical data concerning the crop are given in the accompanying table.

Sugar beets grown on reclamation projects, 1927

Project	Area	Yield		Value	
		Total	Average per acre	Total	Per acre
	<i>Acres</i>	<i>Tons</i>	<i>Tons</i>		
Grand Valley, Colo.....	1,225	12,918	10.5	\$101,158	\$82.57
Uncompahgre, Colo.....	3,139	32,905	10.5	213,882	68.14
Minidoka, Idaho.....	3,223	43,674	13.5	332,827	103.27
Huntley, Mont.....	4,587	55,614	12.12	494,964	108.00
Milk River, Mont.....	619	6,136	9.9	42,952	69.40
Sun River, Mont.....	90	698	7.8	5,584	62.56
Lower Yellowstone, Mont.-N. Dak.....	3,439	34,102	10.0	249,034	72.41
North Platte, Nebr.-Wyo.....	35,220	433,076	12.3	3,410,320	97.00
Newlands, Nev.....	1,073	3,262	3.0	25,280	23.55
Rio Grande, N. Mex.-Tex.....	26			4,579	176.11
Belle Fourche, S. Dak.....	6,021	55,660	9.2	403,535	67.02
Strawberry Valley, Utah.....	1,436	11,912	8.3	86,899	60.51
Shoshone, Wyo.....	5,190	53,244	10.2	471,966	90.94
Total and average.....	65,288	743,201	11.4	5,842,980	89.50

Citrus Fruit Grown on the Projects in 1927

Citrus fruit was grown on 3,000 acres on three Federal irrigation projects in 1927. The total yield amounted to 50,550,000 pounds of fruit, an average of 17,000 pounds per acre. The entire crop

was valued at \$1,550,000, or an average of \$520 per acre.

Most of the crop was grown on the Salt River project, Arizona, where 2,302 acres produced 48,342,000 pounds of fruit valued at \$1,450,260, or \$630 an acre.

The following table gives, by projects, statistics concerning the citrus crop:

Citrus fruit grown on reclamation projects, 1927

Project	Area	Yield		Value	
		Total	Average per acre	Total	Per acre
	<i>Acres</i>	<i>Pounds</i>	<i>Pounds</i>		
Salt River, Ariz.....	2,302	48,342,000	21,000	\$1,450,260	\$630.00
Yuma, Ariz.-Calif.....	1	4,000	4,000	150	150.00
Yuma auxiliary (Mesa) ¹	382	1,042,341	2,732	48,938	128.28
Orland, Calif.....	296	1,161,600	3,924	50,336	170.05
Total and average.....	2,981	50,549,941	16,957	1,549,684	520.00

¹ Young trees not in full bearing.

Reclamation Policy in Russia

By Prof. J. A. Miroff, Director, Russian Bureau of Agricultural Information, New York, N. Y.

THE problem of colonizing unsettled lands and supplying them with irrigation water is a very important one for Russia for the following reasons:

(a) The national economy of Russia has completed its period of reestablishment and has now come to the reconstruction period on the basis of the industrialization of the country as a whole, and the industrialization of agriculture in particular. The country has to face a problem of commercializing agriculture and of extending both domestic and foreign markets. To obtain these results it is necessary to increase the area of the national domain; that is, to bring under cultivation numerous areas of unsettled lands.

(b) Parallel with the growth of the productive forces of national economy in Russia there can be observed in several sections of the country a surplus of agricultural labor. This surplus labor, not finding any employment in the villages, is drifting to the cities to swell the ranks of the unemployed. The country has to face the problem of giving rational employment to the surplus labor of the villages. This problem can be solved by colonizing the unoccupied lands as well as by other measures designed to increase the productivity of labor by increasing the efficiency and intensity of agriculture.

UNOCCUPIED LAND

The exact area of unoccupied lands in Russia is, unfortunately, unknown, as a complete land survey has never been made in Russia. According to the available and entirely incomplete data the total area available for colonization in the Union of Socialist Soviet Republics can be estimated as follows:

In the European part of Russia the total area of unoccupied lands is about 24,000,000 acres. Part of this land is used by several tribes such as reindeer herdsman. This area, is comparatively speaking, small and part of it is already settled. The main problem here is to assist in the settlement of the native population.

The semifrozen marshes, or "tundra," which start at the border of Finland and extend as far as the Okhotsk Sea, have an approximate area of about 900,000,000 acres. This territory, at present occupied by small nomadic tribes of reindeer herdsman, is rather a difficult proposition for agricultural purposes. The long distance from markets, the total absence of means of communication, and the wilder-

ness of this area demand enormous resources and expenditure of labor for subjugating this land to cultivation. This immense territory must be excluded from immediate cultivation.

Prairie and forests, known as "taiga," occupy about 2,500,000,000 acres. Part of this area, located in European Russia, is quite thickly populated in the valleys of its principal rivers. The plateaus between the rivers, however, are almost entirely unused. The problem is to convert these river plateaus into agricultural lands.

According to investigations made during various periods, it has been ascertained that the natural conditions of this territory will permit agricultural operations in latitudes up to 60° and in some places up to 54°. Keeping within the limits of the above latitudes, the area of suitable lands will amount to 90,000,000 acres. From the above there are located:

	Acres
In European Russia.....	6,000,000
In Siberia.....	54,000,000
In the Far East.....	30,000,000

The reclamation of the "taiga" entails many obstacles, as it will require immense capital to build roads, drain swamps, and to stump the cut-over lands.

The Khirgis Republic has about 90,000,000 acres of unoccupied land which is composed of the so-called "Khirgis Steppes."

Turkestan has about 18,000,000 acres, from which about 9,000,000 acres if put under irrigation could be used for cotton growing and the balance for grain growing.

In the pre-war period the total area sown to cotton was about 1,440,000 acres. The cotton yield from the above area was 504,000,000 pounds per annum. The consumption of cotton in pre-war times was about 1,008,000,000 pounds per annum. The irrigation, therefore, of 9,000,000 acres of additional land would increase the cotton yield five times, thus covering not only all requirements of the domestic market but bearing also a surplus for export.

SETTLEMENT PLANS

The physical difficulties in reclaiming the above-mentioned unoccupied territories, also lack of financial resources for colonization work on a large scale, compel the Government of Russia to go slowly and gradually in its work of converting these waste lands into tillable farms. For the immediate 10-year period (1927-1935), the Government of Russia has

made the following tentative colonization plan:

	Persons
Far East.....	1,250,000
Siberia.....	2,000,000
Ural Province.....	500,000
Volga Province.....	264,000
Northern Caucasus.....	200,000
Northern European part of R. S. F. S. R.....	500,000
Total.....	4,714,000

In connection with water communications in the territories to be colonized (Lena, Enissei, Obi, Pechora, northern Dvina and Amur with their tributaries) the Government of Russia is planning to use dredging machinery for the purpose of deepening and cleaning the river channels, the building of locks, docks, etc. These have been worked out on a definite annual appropriation schedule. Much to my regret I do not have these figures on hand.

The average length of railroads in Russia is about one-fourtieth of a kilometer per capita, or 0.0031 kilometer per hectare. For every kilometer of railroad to be constructed it is customary to survey 2 kilometers; that is, 50 per cent of the survey is made on various projects, which are eventually abandoned. The cost of building a kilometer of railroad exclusive of rolling stock and stations in the Far East is estimated at 4,500 rubles, and in all other sections 3,000 rubles. The capital repairs are figured at 800 rubles a kilometer and the cost of surveying 30 rubles a kilometer.

COLONIZATION EXPENSES

The expenses for opening up land for colonization are estimated as follows: In the Far East, 750 rubles per farmstead; in Siberia and the Urals, 700 rubles; and in the steppe district, 300 rubles. In addition to the above expense, 150 rubles is added per farmstead for cultural and economic needs of the settler (schools, hospitals, mails).

The following credits are to be granted to settlers: In Sakhalin, 600 rubles; in the Far East, 500 rubles; and in all other sections, 400 rubles per farmstead.

Besides, every settler must have his own capital for equipment; in Siberia at least 500 rubles is required; in other sections slightly different amounts.

Every settler will be granted special privileges: (a) For traveling he will pay only one-fourth of the railroad fare and his children will be carried free; (b) complete exemption from all taxes during the first three years after settlement.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, chairman, and Miss Mae A. Schnurr, secretary of the American Section of the International Water Commission, spent the first half of March in consultation with the members of the Mexican section of the commission, visiting a number of places in California, Arizona, and Texas in connection with their study of conditions. Doctor Mead then left for Los Angeles on the St. Francis dam investigation. Miss Schnurr returned on March 22.

P. W. Dent, Assistant Commissioner of Reclamation, has been the Acting Commissioner of the bureau during the absence of Doctor Mead.

J. E. Overlade, employed in the accounting division of the Washington office, has been designated a fiscal inspector, and left for the field the latter part of February.

R. C. Walber, former chief clerk of the Belle Fourche project, has been transferred to the accounting division of the Washington office.

Consulting Engineers D. C. Henny, Charles H. Paul, and A. J. Wiley, and Construction Engineer F. A. Banks met recently in the Denver office to consider designs for five different types of dam, comprising three arch studies and two gravity studies, for the Owyhee project, the type recommended being the heavy arch or so-called arch-gravity type.

Dr. Fredrik Vogt, a fellow of the University of Norway, has entered on duty in the Denver office under temporary appointment as an associate engineer. His services will be utilized on research work pertaining to arch dams.

Howard G. Knutson, clerk in the Denver office, broke his leg recently while skiing on Genesee Mountain near Denver.

B. O. Aylesworth, Colorado State Director of the Bureau of Markets, and Tom Howard, secretary-treasurer of the State Farmers Union, held a number of meetings recently on the Uncompahgre project for the purpose of interesting project farmers in the organization of farmers' unions.

Recent visitors at Stony Gorge Dam, Orland project, were C. P. Williams, Los Angeles; J. L. Favela, engineer for the Mexican Government, Mexicali, Mexico; and Walter Ward, San Francisco.

J. S. Pyeatt, president, and A. C. Shields, general manager of the Denver & Rio Grande Western Railroad, attended the recent "farmers' spree" and annual banquet given by the Delta Chamber of Commerce, Uncompahgre project.

Doctor Mead to Study Failure of Dam

Dr. Elwood Mead, Commissioner of Reclamation of the Department of the Interior, has been asked by the Los Angeles City Council to act as chairman of a committee of engineers to investigate the cause of the breaking of the St. Francis Dam, Calif., constructed by the city of Los Angeles for supplying water for domestic use. The Chamber of Commerce also is securing a list of engineers competent to pass on the question from the American Society of Civil Engineers, from which a committee can be appointed to serve with Commissioner Mead.

The board of directors of the Burley irrigation district, Minidoka project, have appointed George A. Haycock manager and Hugh L. Crawford engineer for the district.

J. P. Fitzgerald, associate airways engineer of the Department of Commerce visited the Minidoka project recently to obtain data concerning suitable sites for a landing field.

H. N. Bickel, chief clerk for several years at the American Falls office, has been transferred to the Owyhee project.

E. E. Roddis, district counsel, was on the lower Yellowstone project recently to appear before the county commissioners of McKenzie County relative to obtaining the payment of interest and penalty on water charges which have been withheld by the county.

W. F. Brooks, ditch rider on the Yuma Mesa, Yuma project, a disabled veteran of the World War, died recently of pneumonia.

John W. Cunningham, consulting engineer of Portland, Oreg., visited the Boise project recently in connection with discharge records of Southern Idaho streams.

Recent visitors to the Arrowrock Dam, Boise project, were C. H. Paul, consulting engineer of Dayton, Ohio, who constructed the dam, and F. A. Banks, construction engineer of the Owyhee project.

L. E. Mayhall, general superintendent of fish hatcheries for the State of Washington, accompanied by Mr. Dunstan, of the department of fisheries and game, were recent visitors on the Yakima project.

Lloyd J. Windle, clerk, has been transferred from the North Platte project to the Shoshone project as bookkeeper, cost-keeper, and timekeeper.

E. B. Debler, hydrographic engineer of the Denver office, spent several days on the Newlands project in connection with the report by A. N. Burch on upstream storage.

L. R. Floek, acting superintendent of the Rio Grande project, and L. C. Hill, consulting engineer, met recently with representatives of the El Paso Electric Co. and the board of the El Paso County Water improvement district No. 1 in regard to the proposed contract for the sale of power at Elephant Butte Dam.

J. W. Lawler, president, and J. A. McEachern, vice president of the General Construction Co., made an inspection recently of the work by their organization on the Owyhee project.

Miss Marguerite B. Riswold, assistant clerk, has been transferred from the Huntley project to the Kittitas division of the Yakima project.

George W. Sturm has been reelected president of the board of directors of the Orland Unit Water Users' Association, Orland project, California, for his eighth successive term.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kibach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche	Newell, S. Dak.	F. C. Younghlutt	J. P. Siehenelcher		Wm. J. Burke	Mitchell, Nehr.
Boise ¹	Boise, Idaho	R. J. Newell	W. L. Vernon		B. E. Stoutemyer	Portland, Oreg.
Carlsbad	Carlsbad, N. Mex.	L. E. Foster	W. C. Berger	W. C. Berger	H. J. S. Devries	El Paso, Tex.
Grand Valley	Grand Junction, Colo.	J. C. Page	W. J. Chiesman	C. E. Brodie	J. R. Alexander	Montrose, Colo.
Huntley ²	Ballantine, Mont.	E. E. Lewis				
King Hill ³	King Hill, Idaho	F. L. Kinkaid				
Klamath	Klamath Falls, Oreg.	H. D. Newell	N. G. Wheeler	Joseph C. Avery	R. J. Coffey	Berkeley, Calif.
Lower Yellowstone	Savage, Mont.	H. A. Parker	E. R. Scheppelmann	E. R. Scheppelmann	E. E. Roddis	Billings, Mont.
Milk River	Malta, Mont.	H. H. Johnson	E. E. Chahot	E. E. Chahot	do	Do.
Minidoka ⁴	Burley, Idaho	E. B. Darlington	G. C. Patterson	Miss A. J. Larson	B. E. Stoutemyer	Portland, Oreg.
Newlands ⁵	Fallon, Nev.	A. W. Walker	Erle W. Shepard	Miss E. M. Shmonds	R. J. Coffey	Berkeley, Calif.
North Platte ⁶	Mitchell, Nehr.	H. C. Stetson	Virgil E. Huhbell	Virgil E. Huhbell	Wm. J. Burke	Mitchell, Nehr.
Okanogan	Okanogan, Wash.	Calvin Casteel	W. D. Funk	N. D. Thorp	B. E. Stoutemyer	Portland, Oreg.
Orland	Orland, Calif.	R. C. E. Weher	C. H. Lillingston	C. H. Lillingston	R. J. Coffey	Berkeley, Calif.
Owyhee	Nyssa, Oreg.	F. A. Banks	H. N. Bickel		B. E. Stoutemyer	Portland, Oreg.
Rio Grande	El Paso, Tex.	L. R. Flock	V. G. Evans	L. S. Kennicott	H. J. S. Devries	El Paso, Tex.
Riverton	Riverton, Wyo.	H. D. Comstock	R. B. Smith	R. B. Smith	Wm. J. Burke	Mitchell, Nehr.
Salt River ⁷	Phoenix, Ariz.	C. C. Cragin				
Shoshone ⁸	Powell, Wyo.	L. H. Mitchell	W. F. Sha		E. E. Roddis	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah	Lee R. Taylor				
Sun River ¹⁰	Fairfield, Mont.	G. O. Sanford	H. W. Johnson	H. W. Johnson	E. E. Roddis	Do.
Umatilla ¹¹	Irrigon, Oreg.	A. C. Houghton				
Uncompahgre	Hermiston, Oreg.	Enos D. Martin				
Vale	Montrose, Colo.	L. J. Foster	G. H. Bolt	F. D. Helm	J. R. Alexander	Montrose, Colo.
Yakima	Vale, Oreg.	H. W. Bashore ¹²	C. M. Voyer	C. M. Voyer	B. E. Stoutemyer	Portland, Oreg.
Yuma	Yakima, Wash.	P. J. Preston	R. K. Cunningham	J. C. Gawler	do	Do.
	Yuma, Ariz.	R. M. Priest	H. R. Pasewalk	E. M. Philehaum	R. J. Coffey	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.	Coalville, Utah	F. F. Smith ¹²	C. F. Williams	C. F. Williams	J. R. Alexander	Montrose, Colo.
Kittitas	Ellensburg, Wash.	Walker R. Young ¹²	E. R. Mills		B. E. Stoutemyer	Portland, Oreg.
Sun River, Ghson Dam.	Augusta, Mont.	Ralph Lowry ¹²	F. C. Lewis	F. C. Lewis	E. E. Roddis	Billings, Mont.
Orland, Stony Gorge Dam.	Stony Gorge Damsite, Elk Creek, Calif.	H. J. Gault ¹²	C. B. Funk		R. J. Coffey	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Valley Water Users' Association on Dec. 1, 1926.

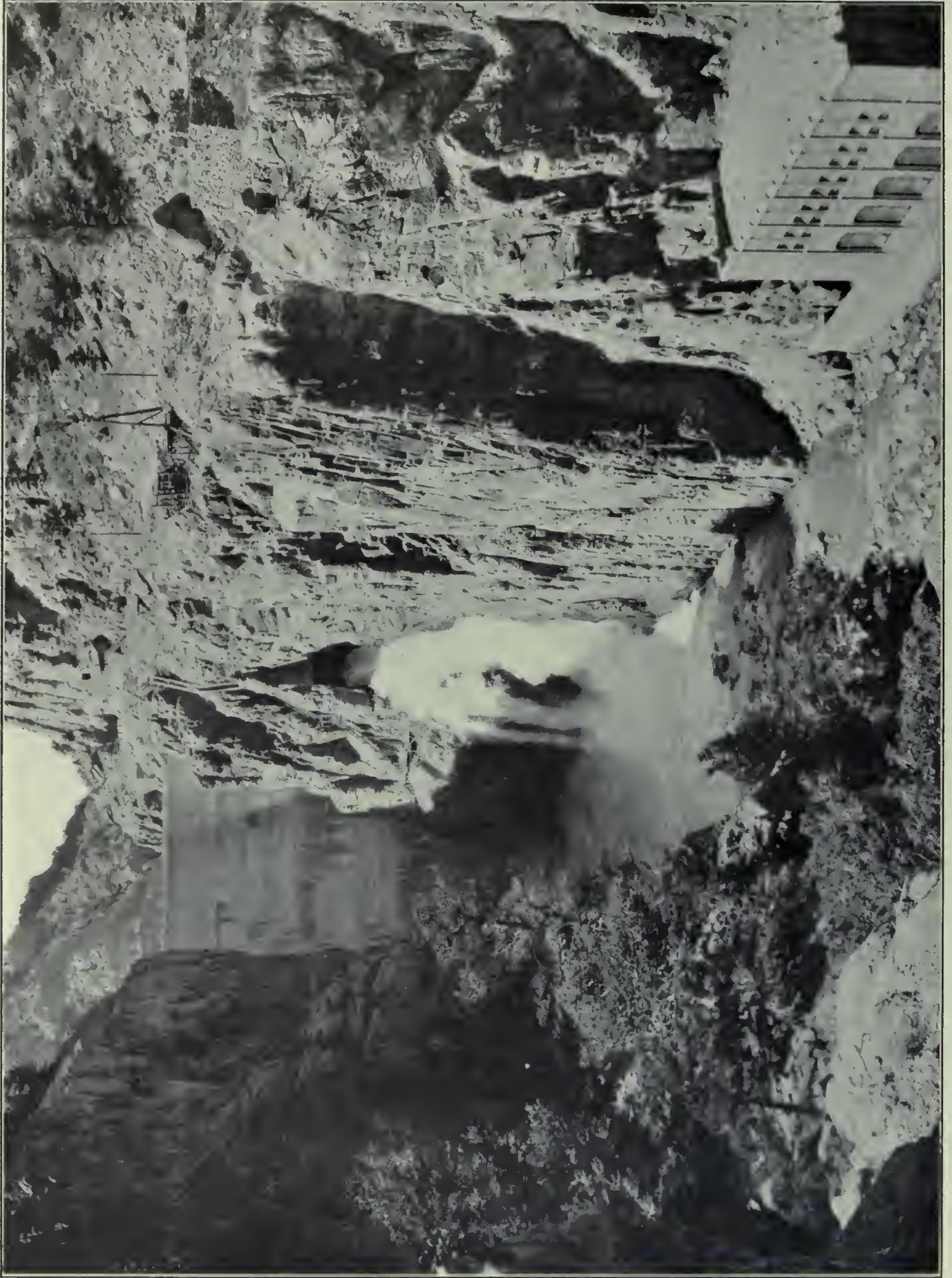
¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande	Albuquerque, N. Mex.		Middle Rio Grande conservancy district.
Heart Mountain investigations	Powell, Wyo.	I. B. Hosig	
Utah investigations	Salt Lake City, Utah	E. O. Larson	State of Utah.



SHOSHONE DAM AND POWER HOUSE, SHOSHONE PROJECT, WYOMING

NEW RECLAMATION ERA

VOL. 19

MAY, 1928

NO. 5



A DAIRY HERD ON THE MILK RIVER PROJECT, MONTANA



RECLAMATION

“THE policy of reclamation is a success. The only remaining great West and the only remaining surplus of agricultural land in this country are the arid lands of the Western States. The richest lands in America, lacking only the application of water to make them produce abundantly, have been kept there, no doubt, under some divine provision as a residuum awaiting the necessity for their development to constitute homes, rural life, and economic development for the States in which they are located as well as for the entire Nation.”

HON. SAMUEL B. HILL

*Member of Congress from
Washington*



NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, 75 cents a year

HUBERT WORK
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

May, 1928

No. 5

Interesting High Lights on the Federal Reclamation Projects

STONY GORGE DAM, under construction on the Orland project, was 85.5 per cent completed at the end of March. On March 26 Stony Creek flow reached a maximum of 12,000 second-feet, the greatest on record at the dam site. The flow was passed safely through two openings between buttresses No. 32 to 34 with no resulting damage.

RATHER more interest than usual is noted in cooperative marketing associations on the Grand Valley and Boise projects. Fruit growers are leading in this activity on the Boise project.

THE office of the Idaho Wool Growers Association has been moved from Twin Falls to Burley, on the Minidoka project, R. C. Rich, of Burley, having been elected president. The association has a membership of about 600 and represents an ownership of nearly 1,000,000 sheep.

IT IS estimated that almost a million eggs were marketed from the Uncompahgre Valley during March by the newly organized Delta and Montrose Poultry Growers Cooperative Association, at a price 4 cents or more above what would have been realized without the services of the association. The five cars of about 500 cases each brought \$12,000 to the valley. The association also handled 17,000 pounds of poultry during the month.

THE Great Northern Railway has let the contract for the construction of their Klamath Falls station at an estimated cost of \$50,000.

THE Klamath County agriculturist has received 33,000 trees from the State Forestry Nursery at Corvallis, Oreg., which have been distributed to Klamath project farmers. The shipment included black locust, green ash, Russian mulberry, Russian olive, black walnut, and Port Orford cedar.

THIRTEEN new families have been placed on the Chinook division and one on the Malta division of the Milk River project. Options have been obtained on 11 tracts in private ownership for sale to prospective settlers at reasonable prices on amortized payments over a period of 20 years.

A MEETING was held recently at Fairfield, Sun River project, under the supervision of the project superintendent and the county agent for the purpose of discussing a diversified farm program under irrigation with livestock as the principal means of disposing of grain and forage crops. The farmers realize that continued wheat growing will not give sufficient returns to make a comfortable living and pay construction and operation and maintenance charges.

THERE is considerable agitation on the North Platte project for the construction of a farmers' cooperative sugar factory.

RECENT tests by the United States Department of Agriculture indicate that the dairy herds on the Newlands project are practically free from tuberculosis. As a result, there is a brisk demand, particularly from California, for producing cows.

RECENT developments indicate that a pipe line from the Montana gas fields will be constructed in the near future to convey this fuel to the vicinity of the Belle Fourche project. The surveyed line runs east of Belle Fourche toward Rapid City, and it is planned to supply all communities where consumption will warrant the investment.

SWIFT & Co. have expressed their interest in the possibilities of the cheese industry on the Belle Fourche project.

A MOVEMENT is on foot on the Newlands project to form a branch of the Federal intermediate credit system connected with the Federal farm loan bank at Berkeley, Calif., the function of which will be to advance loans to dairy-men.

WORK on the electrification of the Stillwater, Harmon, Soda Lake, and Sheckler districts, Newlands project, is progressing steadily. In addition to the advantages of lighting, most of the farmers are planning to capitalize the electrical power in making it do a large part of the farm work.

THE financial condition and credit of the Truckee-Carson Irrigation District appear to be excellent. They have a standing offer from one of the local banks for all of their improvement district bonds at par plus accrued interest.

THE planting of Yuma Valley lands to paper shell pecans continues to gain favor among the water users. Several farmers are planning to plant small acreages to trees next year and others will plant this year if nursery stock can be obtained.

TWENTY acres of grapefruit trees were planted on the Yuma Mesa during March and 15 additional acres were being leveled for planting. Five acres were being leveled for the headquarters of a new syndicate formed largely of local men who expect to plant a considerable acreage this year and next.

ON the Willwood division, Shoshone project, 63 farm applications have been filed and 25 entries completed. It is expected that all desirable units will have been taken by the first of June, and plans are being made to have the second opening sometime prior to the 1st of July.

The St. Francis Dam Failure

From the report of the committee appointed by the city council of Los Angeles to investigate and report the cause of the failure of the St. Francis Dam

By Dr. Elwood Mead, chairman; L. C. Hill; and Gen. Lansing H. Beach. Concurred in by D. C. Henny and R. F. Walter

LOS ANGELES, CALIF.,
March 31, 1928.

To the CITY COUNCIL,
Los Angeles, Calif.

GENTLEMEN: This committee was formed pursuant to the following resolution of the city council of Los Angeles:

2500 (1928). MARCH 16, 1928.

MR. ELWOOD MEAD,
Chief of Reclamation Service of the
United States, Department of Interior,
c/o Councilman Peirson M. Hall.

DEAR SIR: This is to advise that at regular meeting of the city council held March 16, 1928, the following resolution presented by the water and power committee, was adopted:

Whereas the council has heretofore instructed this committee to negotiate with Elwood Mead, Chief of Reclamation Service of the United States Department of Interior, to ascertain whether or not he would act as chairman of a committee of engineers to investigate the cause of the destruction of the St. Francis Dam; and

Whereas, pursuant to said instruction, said committee has negotiated with said Elwood Mead, and has received his consent to act as chairman, and is informed that the Secretary of the Interior has authorized his release from duty of the Department of the Interior for such purpose; and

Whereas said resolution further instructed this committee to secure from the American Society of Civil Engineers the names of competent engineers who would act upon said committee; and

Whereas, your committee is informed by the Secretary of the American Society of Civil Engineers that said society, instead of submitting a list of names, would prefer to serve by collaborating with Elwood Mead as to the formation of said committee;

Now, therefore, be it resolved: That said Elwood Mead is hereby designated as chairman of a committee of engineers to investigate the cause of the destruction of St. Francis Dam, and

Be it further resolved: That said Elwood Mead, as chairman, in collaboration with the American Society of Civil Engineers, be and he is hereby authorized to select an additional two members of said committee.

Respectfully,
(Signed) ROBT. DOMINGUEZ,
City Clerk.

After communicating with Mr. George T. Seabury, secretary of the American Society of Civil Engineers, the chairman with Mr. Seabury's approval designated by you, selected as the other two members, Mr. Louis C. Hill, of Los Angeles, formerly supervising, now consulting engineer of the United States Bureau of Reclamation, who directed preparation of

plans and construction of the Roosevelt and Elephant Butte Dams, and Maj. Gen. Lansing H. Beach, ex-Chief of Engineers, United States Army, under whose direction the Wilson Dam at Muscle Shoals was built. By your authority Mr. D. C. Henny, of Portland, Oreg., formerly supervising, now consulting engineer, United States Bureau of Reclamation, was engaged as investigator and consulting engineer to the committee. Mr. Raymond F. Walter, chief engineer, United States Bureau of Reclamation, having been detailed by the Secretary of the Interior to investigate for that branch of the Federal Government the cause of the failure of the dam, your committee has felt free to have him join it in its investigations and to take advantage of his experience in its investigations and discussions.

All the parties named promptly visited the site of the dam, took samples of the concrete of which the dam was built and also secured specimens of the rocks upon which the dam founded, and carefully examined all materials connected with the construction and which affect the stability of the structure. A description of the samples taken and the results of the tests made of them are given in the report of the testing laboratory.

The city council was requested by letter to furnish the committee certain data relative to the construction of the dam and other matters connected with its failure. The character of the data requested and the action taken by the council in regard to it are shown by the reply thereto under date of March 23, 1928, and are as follows:

MARCH 23, 1928.

MR. PEIRSON M. HALL, Chairman
Water and Power Commission,
City Hall, Los Angeles, Calif.

DEAR SIR: The 16 questions submitted by Dr. Elwood Mead to your committee and referred to this department for attention, are answered as follows:

1. Q. Samples of concrete, from various blocks scattered along the canyon. These samples are to be tested for strength, weight per cubic foot and for absorption.

A. These samples were taken yesterday (March 22) in the presence and under the instructions of Dr. Elwood Mead and Mr. Louis C. Hill, transported to the city and are now in their possession.

2. Q. Samples of schist, taken from left abutment, from points where it adheres to the dam, and from the right abutment. These are to be tested for strength in compression, in shear, and for absorption.

A. Samples of schist were obtained under the same circumstances as in ques-

tion 1, and are now in Doctor Mead's and Mr. Hill's possession for test requested.

3. Q. Samples of conglomerate taken from various points on the right abutment and tested both dry and wet for compressive strength. Samples are also to be immersed in water and after being wet and crushed a sieve analysis should be made, and an analysis made to determine the composition of this conglomerate.

A. Samples of conglomerate have been taken and are now in Doctor Mead's and Mr. Hill's possession.

4. Q. Record of recording gauge on dam during the period March 8, 1928, until after the accident.

A. Photostat copy of recording gauge record was transmitted to Doctor Mead on March 22 by this office.

5. Q. Plans of the dam.

A. Blue prints of the dam are now in the possession of Doctor Mead and his committee.

6. Q. Topographic map of the dam site before the work began.

A. Topographic prints, etc., are also in Doctor Mead's possession.

7. Q. Notes of resident engineer on foundation's condition as found during excavation for the dam.

A. (See answer to question 8.)

8. Q. Topographic map of the dam site or cross sections just before pouring.

A. These records are now in Doctor Mead's possession, as shown by drawing 1142.

9. Q. All reports of the resident engineer during the construction of the dam.

A. Block report now being made and will be furnished when same has been completed.

10. Q. Report of the geologists, Professor Tolman, Dr. Robert T. Hill, and Dr. D. W. Murphy, on the geology of the foundation of the St. Francis Dam.

A. Report of the geologists will be rendered by them.

11. Q. Record of all seepages or leaks, both as to location and quantity, and time of starting. This record wants to be complete enough so that any changes in either the quantity or character of the seepage can be determined, and the time at which changes occurred.

A. Record of all seepages and leaks has been transmitted and is now in Doctor Mead's possession.

12. Q. What changes occurred in the widths of the openings of the contraction joints previous to the failure of the dam? This applies both to the cracks in the dam and in the abutment. Inspection shows that cracks in that portion of the dam along the ridge had been caulked with oakum, and that since these cracks were caulked the cracks had opened still wider than when originally caulked. Did the opening of these cracks occur before the dam failed, or afterwards, or at the time of failure?

A. This question will be answered by Mr. Mulholland at an interview before the committee.

13. Q. What work was done to take care of leakage along the dyke on the west side and when was the drain dug?



St. Francis Dam, downstream face of standing section

45° or more and lying in such a direction that this dip is practically parallel to the east side of the canyon at the site of the dam. In fact it may be considered that it is the face of this rock which now forms the bank on this side. This cleavage extends over large areas along uniform planes from bottom to top and provides slippery sliding surfaces with small adherence, extremely favorable to the formation of large slides when undercut. This explains the extensive slides which have occurred at the east end of the dam.

On the west bank of the canyon it is the edges of the layers which are exposed, permitting a greater penetration of water and perhaps a deeper decomposition with greater friability, but not the same tendency to slide as on the east side. The schist showed a compressive strength for the six samples tested of from 3,600 to 11,000 pounds per square inch and it was found that samples soaked in water for 10 minutes and for 24 hours developed no less strength than those tested dry, owing no doubt to the water-tightness of the material itself.

Above this schist on the west bank is a mass of red material commonly called conglomerate on account of the considerable number of pebbles and pieces of harder material imbedded in it. The line of separation between the schist and the red conglomerate is very clear and distinct and forms what is geologically known as a dead fault.

This red conglomerate is not uniform in character. It varies greatly in hardness as is shown by the manner in which the foundation is eroded. There are spots which are hard and resist the action of water, but the great mass when dry appears to have the character of stone but when wet disintegrates rapidly to a slippery friable mass or even loses all shape even in a few minutes. A piece immersed in water gives out bubbles of air practically until the time of collapse, showing that it is thoroughly porous, the absorption amounting to 1.5 per cent of its weight. When wet in situ the surface is promptly changed to a slippery substance as little able to keep anything standing upon it from sliding as can well be imagined. Three samples of this were tested dry; they broke at pressures of from 600 to 1,960 pounds per square inch, 2 samples were soaked in water for 10 minutes and broke at 210 and 845 pounds per square inch respectively, while 2 other samples, picked from points in the west hill side near the points from where the other samples were taken, were soaked in water for 24 hours and disintegrated into fine particles and sand grains and therefore could not be tested. A large number of additional samples

were taken from various points in the west hill side under the dam base and submerged in water and all disintegrated within a few hours.

The cementing material in the red conglomerate consists of clay, iron oxides, and amorphous silica. The clay and silica soften in the presence of water while the iron oxides dissolve. The conglomerate readily absorbs water to the extent of about 1.5 per cent of its weight. The percolation of the water into the conglomerate would soften the cementing material and would dissolve the gypsum which filled some of the fissures in the formation. The effect of softening or removing the binder would be to at once reduce the crushing strength of the mass and its ability to sustain the weight of the dam, and the effect of dissolving the slowly soluble gypsum which filled some of the fissures would be to open up these fissures and loosen the masses of material that are between them. It would also permit freer movement of water into and through the rock. If the water passing through these fissures carried with it gypsum in solution, the water would remain clear and would carry no evidence that it was washing away part of the foundation of the dam.

As the leakage increased it might carry with it particles of the conglomerate on either side of the fissures, but in many cases this material contained so little clay or claylike material that the water would be reasonably clear on emerging from under the dam on the downstream side.

The dam was inspected by Messrs. Mulholland and Van Norman on March 12, 1928, and they both have informed the committee that they observed nothing abnormal at that time nor saw anything that could cause apprehension. The former, when asked if he knew anything concerning the reports which had gained some circulation to the effect that muddy water had been coming through the dam, stated that work was in progress upon the road on the south side, i. e., downstream side, of the hogback and that some of the earth moved had been allowed to slide into the seepage streams issuing from the wall, thus coloring them, but he was positive that all such streams were perfectly clear when they first appeared below the dam and were not unusual in amount of flow. They stated, however, that the amount of flow had increased from 7.6 miner's inches on February 29, 1928, to what they judged to be about 50 miner's inches.

The height of water in the reservoir was registered by a self-recording Stevens gauge located upon that portion of the dam which was not destroyed, and its record has been preserved.

From this record it is evident that the dam failed shortly after midnight of March 12-13, the structure being completely destroyed, with the exception of one block from 80 to 100 feet long.

So far as known no person now living saw the dam fail. A study of the gauge record indicates an increasing leakage past the dam for some hours and then a rapidly increasing fall of the water of the reservoir. It was some 25 to 30 minutes from the time when the outflow began to be sufficient in amount to show upon the gauge until the flow reached 10,000 cubic feet per second. After this time the outflow increased within a few minutes; it exceeded 600,000 cubic feet per second as block after block of the dam went out. The accompanying table shows the story of discharges as computed from the gauge and the capacity curve of the reservoir.

Rate of flow based on fall of reservoir as shown by recording gauge in cubic feet per second

Gauge time	Least estimated flow	Greatest estimated flow
12:30.....	300	1,200
12:20.....	2,000	4,000
12:30.....	10,000	25,000
12:35.....	100,000	150,000
12:40.....	400,000	500,000
12:50.....	600,000	700,000

The very small time scale (0.1 inch=1 hour) precludes close or accurate estimates.

The manner of failure apparently was that the first leak, however started, began under the concrete at that part of the dam which stood on the red conglomerate; this leak increased in volume as it scoured away the foundation material already greatly softened by infiltrated water from the reservoir which removed the support of the dam at this point, and since no arch action could occur by reason of yielding conglomerate abutment made failure of the dam inevitable. The water passing under the dam ran directly down the hillside toward the steep slope of the east bank, causing it to be undermined and to slide. It was such a slide of the bank which early produced the break in the transmission line of the Southern California Edison Co. and not the breaking of the dam itself.

This slide was followed by others, causing the undermining of the east end of the dam. The sequence of failure is uncertain. With the undermining of the dam on both sides, section after section of the dam failed, leaving only the central section in place.

The belief that the first break occurred on the west side is based on the fact that the foundation on that side was poorest,

and is confirmed by the fact that the portions of concrete which form this part of the dam have completely disappeared from the site, and immense broken blocks are found far down the stream, while with one exception the broken portions on the east side are more nearly in place and occupy positions which would indicate that this part of the dam failed by undermining rather than by the thrust of the impounded water.

The scour is greater on the east side than on the west, as would be expected from the position of the lamination of the schist on the two sides. On the east a slight undermining would bring down a considerable slice of the hillside, the process being continuous as long as the destructive forces acted, while on the

west, as soon as the softened portion had been swept away, material fairly resistant to erosion was encountered with no tendency of the material itself to slide.

Triangulation upon the block still standing shows that its top moved downstream about 0.7 foot and was slightly twisted, but it can not be stated positively that this has resulted from the thrust of the water or from the twisting effect produced when the adjacent parts of the dam were torn loose or from a combination of the two actions.

CONCLUSION

Your committee, having considered and examined all the evidence which it has been able to obtain to date, reports its conclusions as follows:

1. The type and dimensions of the dam were amply sufficient if based on suitable foundation.

2. The concrete of which the dam was built was of ample strength to resist the stresses to which it would be normally subjected.

3. The failure can not be laid to movements of the earth's crust.

4. The dam failed as a result of defective foundations.

5. This failure reflects in no way on the stability of a well-designed gravity dam properly founded on suitable bed rock.

ELWOOD MEAD, *Chairman.*

L. C. HILL.

LANSING H. BEACH.

We concur:

D. C. HENNY.

R. F. WALTER.

Safety Measures Taken by Bureau in Constructing Irrigation Dams

Illustrated by the precautions taken with the foundations for the Stony Gorge Dam now under construction on the Orland project, Calif.

IN view of the recent failure of the St. Francis Dam in California, the precautions taken by the Bureau of Reclamation with the foundation on which will rest the Stony Gorge Dam are doubly interesting. The dam is being constructed across Stony Creek about 8 miles west of Fruto, Calif., and will store water for the Orland irrigation project. The structure will be of the buttressed type, with a reinforced-concrete face slab. It will have a maximum height of about 120 feet above the stream bed and a crest length of about 900 feet. (See back page of cover.)

TESTING THE FOUNDATION

The foundation was tested by drilling 10 holes varying in depth from 30 to 110 feet, which disclosed a predominating stratum of pebble and boulder conglomerate having a thickness of about 75 feet. The rock upstream from the conglomerate stratum was found to consist almost

entirely of sandstone, with a negligible amount of shale and an occasional thin stratum of conglomerate. Downstream the rock was shale interbedded with shaly sandstone and sandstone.

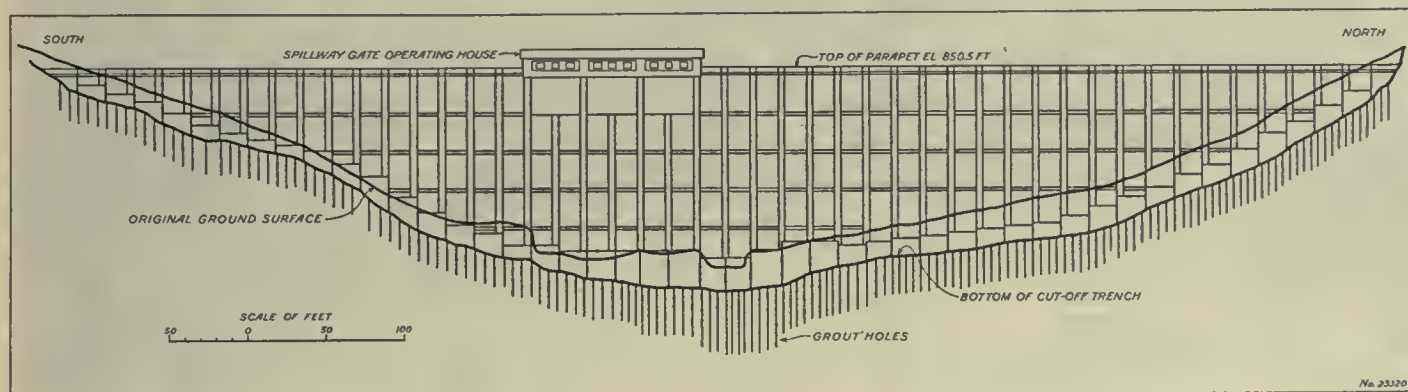
GEOLOGICAL EXAMINATION

Prof. Carton D. Hulin, a geologist of the University of California, made an examination of the site and submitted a report on its suitability for storage purposes from a geological standpoint. He found a fault line passing through the site along which seepage might occur, but which he said could probably be eliminated by grouting. He called attention to the possibility of a slight lateral movement, which he thought, however, highly improbable; also the more serious possibility of a slight settling of the hanging wall of the fault, which might take place when loaded with the dam structure. The report stated that the sandstone and

conglomerates were competent rocks as regards bearing strength, and that the shale downstream should be properly protected to prevent erosion.

Mr. John L. Savage, designing engineer, Bureau of Reclamation, visited the site and after an examination of conditions reported as follows:

The dam will be founded on conglomerate or sandstone of good quality and the only defects in the foundation conditions are (a) the presence of a fault along the stream bed, and (b) the presence of shale interbedded with the sandstone downstream from the dam where erosion from spillway and outlet flow becomes a factor in the design. The fault where exposed to view in the immediate vicinity of the dam site is well cemented and shows no evidence of recent movement. By thoroughly grouting about 200 feet of the fault where crossed by the dam, all leakage can be stopped and the possibility of settlement along the fault reduced. The designs should provide for grouting at 10-foot intervals along the fault with holes 30 feet deep. The dam should be



Downstream elevation of Stony Gorge Dam, showing depth of cut-off trench and depth and spacing of grout holes

45° or more and lying in such a direction that this dip is practically parallel to the east side of the canyon at the site of the dam. In fact it may be considered that it is the face of this rock which now forms the bank on this side. This cleavage extends over large areas along uniform planes from bottom to top and provides slippery sliding surfaces with small adherence, extremely favorable to the formation of large slides when undercut. This explains the extensive slides which have occurred at the east end of the dam.

On the west bank of the canyon it is the edges of the layers which are exposed, permitting a greater penetration of water and perhaps a deeper decomposition with greater friability, but not the same tendency to slide as on the east side. The schist showed a compressive strength for the six samples tested of from 3,600 to 11,000 pounds per square inch and it was found that samples soaked in water for 10 minutes and for 24 hours developed no less strength than those tested dry, owing no doubt to the water-tightness of the material itself.

Above this schist on the west bank is a mass of red material commonly called conglomerate on account of the considerable number of pebbles and pieces of harder material imbedded in it. The line of separation between the schist and the red conglomerate is very clear and distinct and forms what is geologically known as a dead fault.

This red conglomerate is not uniform in character. It varies greatly in hardness as is shown by the manner in which the foundation is eroded. There are spots which are hard and resist the action of water, but the great mass when dry appears to have the character of stone but when wet disintegrates rapidly to a slippery friable mass or even loses all shape even in a few minutes. A piece immersed in water gives out bubbles of air practically until the time of collapse, showing that it is thoroughly porous, the absorption amounting to 1.5 per cent of its weight. When wet in situ the surface is promptly changed to a slippery substance as little able to keep anything standing upon it from sliding as can well be imagined. Three samples of this were tested dry; they broke at pressures of from 600 to 1,960 pounds per square inch, 2 samples were soaked in water for 10 minutes and broke at 210 and 845 pounds per square inch respectively, while 2 other samples, picked from points in the west hill side near the points from where the other samples were taken, were soaked in water for 24 hours and disintegrated into fine particles and sand grains and therefore could not be tested. A large number of additional samples

were taken from various points in the west hill side under the dam base and submerged in water and all disintegrated within a few hours.

The cementing material in the red conglomerate consists of clay, iron oxides, and amorphous silica. The clay and silica soften in the presence of water while the iron oxides dissolve. The conglomerate readily absorbs water to the extent of about 1.5 per cent of its weight. The percolation of the water into the conglomerate would soften the cementing material and would dissolve the gypsum which filled some of the fissures in the formation. The effect of softening or removing the binder would be to at once reduce the crushing strength of the mass and its ability to sustain the weight of the dam, and the effect of dissolving the slowly soluble gypsum which filled some of the fissures would be to open up these fissures and loosen the masses of material that are between them. It would also permit freer movement of water into and through the rock. If the water passing through these fissures carried with it gypsum in solution, the water would remain clear and would carry no evidence that it was washing away part of the foundation of the dam.

As the leakage increased it might carry with it particles of the conglomerate on either side of the fissures, but in many cases this material contained so little clay or claylike material that the water would be reasonably clear on emerging from under the dam on the downstream side.

The dam was inspected by Messrs. Mulholland and Van Norman on March 12, 1928, and they both have informed the committee that they observed nothing abnormal at that time nor saw anything that could cause apprehension. The former, when asked if he knew anything concerning the reports which had gained some circulation to the effect that muddy water had been coming through the dam, stated that work was in progress upon the road on the south side, i. e., downstream side, of the hogback and that some of the earth moved had been allowed to slide into the seepage streams issuing from the wall, thus coloring them, but he was positive that all such streams were perfectly clear when they first appeared below the dam and were not unusual in amount of flow. They stated, however, that the amount of flow had increased from 7.6 miner's inches on February 29, 1928, to what they judged to be about 50 miner's inches.

The height of water in the reservoir was registered by a self-recording Stevens gauge located upon that portion of the dam which was not destroyed, and its record has been preserved.

From this record it is evident that the dam failed shortly after midnight of March 12-13, the structure being completely destroyed, with the exception of one block from 80 to 100 feet long.

So far as known no person now living saw the dam fail. A study of the gauge record indicates an increasing leakage past the dam for some hours and then a rapidly increasing fall of the water of the reservoir. It was some 25 to 30 minutes from the time when the outflow began to be sufficient in amount to show upon the gauge until the flow reached 10,000 cubic feet per second. After this time the outflow increased within a few minutes; it exceeded 600,000 cubic feet per second as block after block of the dam went out. The accompanying table shows the story of discharges as computed from the gauge and the capacity curve of the reservoir.

Rate of flow based on fall of reservoir as shown by recording gauge in cubic feet per second

Gauge time	Least estimated flow	Greatest estimated flow
12:0.....	300	1,200
12:20.....	2,000	4,000
12:30.....	10,000	25,000
12:35.....	100,000	150,000
12:40.....	400,000	500,000
12:50.....	600,000	700,000

The very small time scale (0.1 inch=1 hour) precludes close or accurate estimates.

The manner of failure apparently was that the first leak, however started, began under the concrete at that part of the dam which stood on the red conglomerate; this leak increased in volume as it scoured away the foundation material already greatly softened by infiltrated water from the reservoir which removed the support of the dam at this point, and since no arch action could occur by reason of yielding conglomerate abutment made failure of the dam inevitable. The water passing under the dam ran directly down the hillside toward the steep slope of the east bank, causing it to be undermined and to slide. It was such a slide of the bank which early produced the break in the transmission line of the Southern California Edison Co. and not the breaking of the dam itself.

This slide was followed by others, causing the undermining of the east end of the dam. The sequence of failure is uncertain. With the undermining of the dam on both sides, section after section of the dam failed, leaving only the central section in place.

The belief that the first break occurred on the west side is based on the fact that the foundation on that side was poorest,

and is confirmed by the fact that the portions of concrete which form this part of the dam have completely disappeared from the site, and immense broken blocks are found far down the stream, while with one exception the broken portions on the east side are more nearly in place and occupy positions which would indicate that this part of the dam failed by undermining rather than by the thrust of the impounded water.

The scour is greater on the east side than on the west, as would be expected from the position of the lamination of the schist on the two sides. On the east a slight undermining would bring down a considerable slice of the hillside, the process being continuous as long as the destructive forces acted, while on the

west, as soon as the softened portion had been swept away, material fairly resistant to erosion was encountered with no tendency of the material itself to slide.

Triangulation upon the block still standing shows that its top moved downstream about 0.7 foot and was slightly twisted, but it can not be stated positively that this has resulted from the thrust of the water or from the twisting effect produced when the adjacent parts of the dam were torn loose or from a combination of the two actions.

CONCLUSION

Your committee, having considered and examined all the evidence which it has been able to obtain to date, reports its conclusions as follows:

1. The type and dimensions of the dam were amply sufficient if based on suitable foundation.

2. The concrete of which the dam was built was of ample strength to resist the stresses to which it would be normally subjected.

3. The failure can not be laid to movements of the earth's crust.

4. The dam failed as a result of defective foundations.

5. This failure reflects in no way on the stability of a well-designed gravity dam properly founded on suitable bed rock.

ELWOON MEAD, *Chairman.*

L. C. HILL.

LANSING H. BEACH.

We concur:

D. C. HENNY.

R. F. WALTER.

Safety Measures Taken by Bureau in Constructing Irrigation Dams

Illustrated by the precautions taken with the foundations for the Stony Gorge Dam now under construction on the Orland project, Calif.

IN view of the recent failure of the St. Francis Dam in California, the precautions taken by the Bureau of Reclamation with the foundation on which will rest the Stony Gorge Dam are doubly interesting. The dam is being constructed across Stony Creek about 8 miles west of Fruto, Calif., and will store water for the Orland irrigation project. The structure will be of the buttressed type, with a reinforced-concrete face slab. It will have a maximum height of about 120 feet above the stream bed and a crest length of about 900 feet. (See back page of cover.)

TESTING THE FOUNDATION

The foundation was tested by drilling 10 holes varying in depth from 30 to 110 feet, which disclosed a predominating stratum of pebble and bowlder conglomerate having a thickness of about 75 feet. The rock upstream from the conglomerate stratum was found to consist almost

entirely of sandstone, with a negligible amount of shale and an occasional thin stratum of conglomerate. Downstream the rock was shale interbedded with shaly sandstone and sandstone.

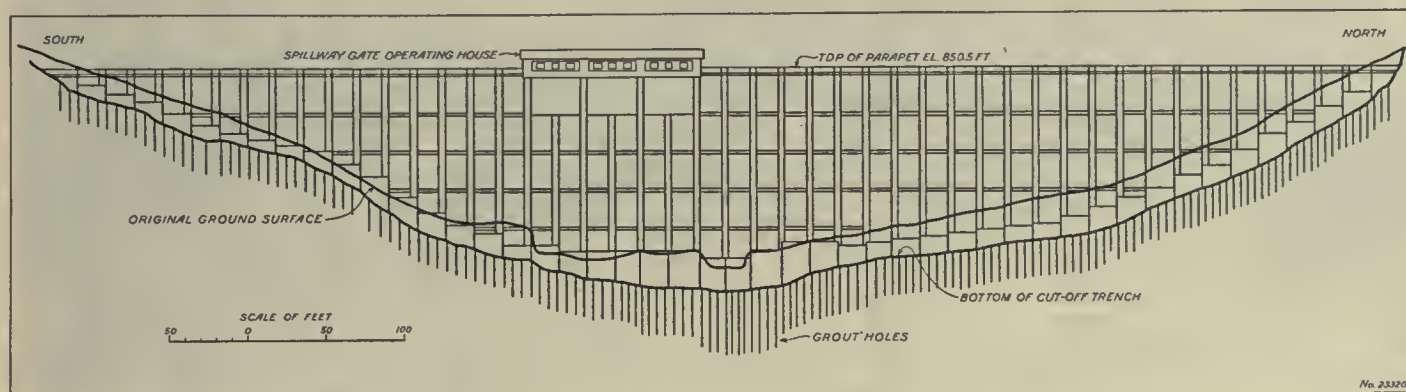
GEOLOGICAL EXAMINATION

Prof. Carlton D. Hulin, a geologist of the University of California, made an examination of the site and submitted a report on its suitability for storage purposes from a geological standpoint. He found a fault line passing through the site along which seepage might occur, but which he said could probably be eliminated by grouting. He called attention to the possibility of a slight lateral movement, which he thought, however, highly improbable; also the more serious possibility of a slight settling of the hanging wall of the fault, which might take place when loaded with the dam structure. The report stated that the sandstone and

conglomerates were competent rocks as regards bearing strength, and that the shale downstream should be properly protected to prevent erosion.

Mr. John L. Savage, designing engineer, Bureau of Reclamation, visited the site and after an examination of conditions reported as follows:

The dam will be founded on conglomerate or sandstone of good quality and the only defects in the foundation conditions are (a) the presence of a fault along the stream bed, and (b) the presence of shale interbedded with the sandstone downstream from the dam where erosion from spillway and outlet flow becomes a factor in the design. The fault where exposed to view in the immediate vicinity of the dam site is well cemented and shows no evidence of recent movement. By thoroughly grouting about 200 feet of the fault where crossed by the dam, all leakage can be stopped and the possibility of settlement along the fault reduced. The designs should provide for grouting at 10-foot intervals along the fault with holes 30 feet deep. The dam should be



Downstream elevation of Stony Gorge Dam, showing depth of cut-off trench and depth and spacing of grout holes

located to avoid as far as possible the crossing of the fault with the buttresses and to avoid crossing the fault with the spillway or outlet sections of the dam. The dam will be designed with contraction joints between all buttresses and face slabs, which will insure a flexible structure much safer against damage from settlement or other movement along fault than would be the case with a dam of continuous construction. The presence of the softer rock downstream from the dam will necessitate concrete paving for about 50 feet below the spillway.

REVIEW BY BOARD OF ENGINEERS

The designs, estimates, and specifications were reviewed by a board of engineers comprising A. J. Wiley and John L. Savage, who recommended that the Ambursen type of dam, if designed with contraction joints between all face slabs and buttresses, would constitute a reasonably flexible structure which would not be seriously damaged by any lateral movement along the fault line or a slight settling which might occur in the foundation rock. The board recommended that the fault be thoroughly grouted to insure against movement due to settlement.

EXCAVATING THE FOUNDATION

Great care was exercised in excavating for the foundation of the dam and outlet works, the excavation being made sufficiently deep to secure foundation on sound ledge rock, free from open seams or other objectionable defects. The foundations for the buttresses were carried below the surface of the sound bedrock and special precautions were taken to preserve the rock outside of and below the

line of excavation in the soundest possible condition.

The surface of the rock foundation was left rough, so as to bond well with the concrete, and where necessary was cut to rough benches or steps to secure the required roughness. Special care was taken not to shatter or disturb the rock foundations unnecessarily. All loose fragments, spalls, dirt, and gravel were removed from rock surfaces to be covered with concrete. Immediately before placing concrete on or against any rock surface, it was thoroughly cleaned. After cleaning and before placing concrete, all water was removed from depressions so that the surface could be thoroughly inspected and proper bond made with the foundation rock.

GROUTING OPERATIONS

The specifications under which contract was made with the Ambursen Dam Co. of New York City for construction of the dam provided for drilling grout holes in the bottom of the upstream cut-off trench at about 5-foot intervals, and at varying depths up to 40 feet. The estimated quantities were 7,000 linear feet of drilling and 1,500 cubic feet of pressure grouting.

The pipes for grouting were also set over springs or crevices in the rock or other foundation defects wherever directed by the engineer in charge. As the work progresses, if leakage develops or the surrounding foundation indicates the advisability of additional grouting, it is proposed to drill holes through the concrete into the underlying foundation. The

grout was forced into each drilled grout hole and grout connection under a pressure of from 90 to 100 pounds per square inch. No grout hole or grout connection under the upstream cut-off wall was grouted until all concrete required in the wall within a distance of 50 feet was placed and set.

Grouting operations were completed in December, 1927. In all 160 holes were drilled, of which 5 holes near the fault line took 156 sacks of cement. The other holes required but little more than the amount necessary to fill the drill hole and pipe. With all these precautions having been taken to insure a safe foundation, concrete is now being poured and up to April 1 about 35,135 cubic yards had been placed, which represents 81 per cent of the concrete for the whole structure.

Contract Let for New Dam in Mexico

Consul Frank Bohr, of Mexicali, Mexico, in a recent report states that the contract has been signed for the construction of the Garcia dam on the Tia Juana River about 11 miles from Tia Juana. The dam is to be 255 feet high and will cost \$1,500,000. The capacity of the reservoir is estimated at 22,700 acre-feet. The stored water will be used for domestic, municipal, and power purposes and for the irrigation of about 7,000 acres of land in the vicinity of Tecate and Tia Juana and in the Esenada municipality as far south as Descanso.



Jackson Lake, Wyo., a storage reservoir for the Minidoka project, Idaho

Economic Notes From The Irrigation Projects

Mint Growing On The Sunnyside Division, Yakima Project, Wash.

By Maurice D. Scroggs, Irrigation Manager, Sunnyside Division

A RECENT bulletin on peppermint, issued by the Washington State College and prepared by H. J. Jensen, M. S., of the State experiment station at Prosser, states:

The growing of peppermint is undoubtedly one of the most popular subjects discussed by northwest farmers in the last two years. The oil was first produced commercially in New York, and then for years in the Indiana-Michigan district. In later years it has been shown that the mild winters and the long growing seasons and abundant sunshine, in certain sections of the Pacific northwest, are quite ideal for peppermint culture. So one might logically prophesy that the centralization of this industry is about to move west again.

In 1915, only 15 acres of mint were being grown in the Pacific northwest. In 1927, 3,500 acres were harvested. One of the original growers was W. J. Turnidge, located in the Willamette Valley, Oreg. In 1926, he came to the Yakima Valley seeking a more favorable location for mint growing. The heavy fall rains of the coast had proven a serious hazard to the crop. He put in 16 experimental plats, scattering them from Granger to Kennewick. The results from these small plantings, and further observations and study, convinced him that the Yakima Valley offered exceptional advantages for

mint growing. He interested others in the crop and mint growing in the Yakima Valley was launched.

The results for 1927 were again encouraging. There were 20 growers, and 26.5 acres, with an estimated 50 per cent stand, were harvested. The yield was 1,022 pounds, an average of 39 pounds per acre. The minimum yield, from a very poor stand inadequately cared for, was approximately 19 pounds per acre. The maximum yield was 92 pounds per acre. From 22 acres, the average yield was 43 pounds per acre. A net price of \$2.09½ per pound was realized from the oil, or an average return of over \$80 per acre.

Mr. Jensen states that the average price for the first years, 1919 to 1924, was \$3.50 per pound. Mr. Turnidge states the average price from 1918 to 1927 was \$5.20 per pound and for the past 34 years \$3.20. He claims, however, that while in only three years, 1909, 1915, and 1922, had the price reached the minimum of \$1.40, growers should not anticipate greater returns than from \$2 to \$3 per pound.

It was realized from the start that the mint-growing industry on an irrigated project must be a cooperative industry to realize the greatest returns to the

growers. This led to the organization of the Sunnyside Mint Co. Only growers can be stockholders. It started with 20 stockholders, with a total stock of \$4,000. The capital stock was increased January 1, 1928, to \$25,000. There were on April 1 about 100 stockholders, representing approximately 200 acres. It is expected that a total of 400 acres will be involved before the end of the season.

The Sunnyside Mint Co. is a unique cooperative enterprise. The grower gives his note for \$50 to the company and receives the roots necessary to plant one acre. He is also given one share of stock. This note is liquidated by the returns from his oil and stock surrendered. Last year the company built a small still at Kennewick. This year they plan a larger one to be erected at Sunnyside. A storage cellar for roots has been leased. At a cost of \$2,000 the new distillery plant will be built in connection with the Roy Fitts cold storage plant from whom warehouse space and a steam plant will also be leased. This plant will handle peppermint from 400 acres and can be enlarged to care for 1,000 acres. In addition to handling the distillation, for which 25 per cent of the oil produced is kept in payment, the company also furnishes the roots for planting, getting them from the growers. The



Purebred Holsteins on the Minidoka project, Idaho

grower receives 25 cents per sack for digging and gathering. These are sold for \$1.25 per sack, the total receipts being prorated to all the growers, not on the basis of roots furnished, but on the basis of the estimated quantity of roots available. The company also sells the oil. It is expected that the returns from sales of roots will pay the cost of overhead. The company is also equipped to prepare fields to plant same, if growers wish, and agree to pay the cost thereof. It is expected that it will be possible later to finance growers to some extent.

The present officers of the Sunnyside Mint Co. are as follows: Glenn Campbell, president; G. A. Kirchner, treasurer, W. J. Turnidge, manager and secretary; Fred Jewell, H. A. MacEdwards, Chester Ferson, and G. A. Kirchner, directors; Stephen E. Chaffee, attorney.

A moving spirit in the organization of the company and the promotion of mint growing on the Sunnyside division has been an old time settler and resident of Sunnyside, H. M. Lichty.

General considerations which the mint enthusiasts urge on behalf of the crop are as follows:

1. A good crop is produced the first year.
2. The oil can be held for favorable prices for a number of years if desirable.

3. Crop is small in bulk and does not involve heavy handling and freight charges.

4. One planting will produce crops for several years—in many instances more than 10 years.

5. Mint is a hardy crop and has few natural enemies.

6. The average price of the crop is good.

7. Constantly growing demand. In 1926 this was 26 per cent over that for 1925.

Special considerations which apply to mint growing in the Yakima Valley are as follows:

1. Comparatively little danger from frost injury.

2. No danger of seriously heavy fall rains at harvesting time.

3. Irrigation insures against drought and makes possible a heavy growth.

4. Favorable soil conditions. It is urged that no soil is too good for the crop. While peppermint from alkali tracts has been found to yield an oil generally of a high ester and menthol content, it has not yet been determined whether peppermint will thrive on badly alkali land.

5. Small holdings and type of settlers render a cooperative handling of the crop possible.

6. Sunshine results in high quality oil, insuring a better and surer market. The

standard grade for peppermint designates a menthol content of 50 per cent and of ester 5 per cent. The average menthol content of Michigan, Indiana, and New York oils has been 36 per cent. Analysis of oil produced locally in 1927 was as follows:

Minimum:	Per cent
Menthol.....	34.66
Ester.....	3.12
Maximum:	
Menthol.....	62.74
Ester.....	8.49

The 16 experimental plats in 1926 yielded a composite menthol content of 53.7 per cent.

7. Long growing season, insuring one good crop and possibly two each year.

8. Comparatively mild winters, minimizing danger of freezing.

It would appear that this new crop is being promoted with a proper degree of conservatism. No one is being urged to plunge. Small plantings by a large number of farmers will best develop the technic of successful peppermint culture in the Yakima Valley. This policy also minimizes the danger from speculation which always attends any crop with a wide range of fluctuating prices.

The writer is indebted to W. J. Turnidge and H. M. Lichty of Sunnyside for the data used in this article.

Lamb Feeding Demonstration on the Uncompahgre Project, Colo.

Conducted by the extension service of the Colorado Agricultural College, under the direction of George E. Morton, chief, Department of Animal Husbandry; B. W. Fairbanks, associate professor; and R. H. Tucker, county extension agent

THE results of the lamb feeding demonstration conducted at Delta, Colo., on the Uncompahgre irrigation project, as reported in a recent issue of the Montrose Daily Press, show conclusively that greatest gains, cheapest gains, and greatest profits result when sugar beet by-products are included in the ration.

Ten lots of 50 lambs each were purchased from the Marysvale, Utah, district. Each lot was of uniform weight, averaging about 60 pounds at the start. Feeding demonstrations began on November 11, 1927. Individual weights of lambs were secured on three consecutive days at the beginning and end of the test. Lot weights were taken every 10 days throughout the demonstration. All feed was weighed to the lambs, alfalfa hay being weighed to the individual lots. Figures for the various lots follow, with comments by Professor Fairbanks:

THE RESULTS

Lot No. 1, fed on corn and alfalfa hay. Final weight, 91.67; gain, 29.73; average

daily gain, 0.28; daily feed, corn, 0.94; alfalfa hay, 2.20. Feed cost per 100 pounds gain, \$10.09. Estimated cost at Kansas City, \$12.04; necessary selling price to break even, \$13.50.

Comment.—This is the standard feed of Nebraska. The Nebraska Agricultural College, after years of feeding demonstrations, has come to the conclusion it is the most successful ration for that region. In Colorado we have different conditions and different margins with respect to alfalfa and corn. In this region it is one of the most expensive operations and with one exception, the highest price must be secured in order to break even. The corn in this demonstration had to be bought at \$1.80.

Lot No. 2, fed barley and hay; final weight, 94.80; gain, 34.22; average daily gain, 0.32; daily feed, barley, 0.02; hay, 2.17; feed cost per 100 pounds gain, \$7.70; estimated cost at Kansas City, \$11.69; necessary selling price to break even, \$12.71.

Comment.—Barley is a good ration. It fits into the rotations better than corn, sometimes. Barley produced cheaper gains than corn. We find barley has reduced the gain cost and selling price. One ton of barley is equal to 2,334 pounds of corn and 780 pounds of hay. A ton of barley worth \$30 has the value of feed replacement of \$45.15. Last year in this demonstration barley did not do so well. One year is not enough for a demonstration. It takes a series of years with varying climate and conditions. We find at college that barley and corn are about equal. We say barley and corn are of equal value in producing gains and in feeding results.

Grinding hay, corn, and barley does not do any good with sheep. Except, perhaps, on large demonstrations with several thousand feed in the lot, then grinding hay might save enough waste, if hay were high, to pay the cost. But with \$8 and \$10 hay, grinding does not save enough waste to pay the cost of grinding.

Stack burned hay is more palatable to sheep and dairy cows, so that many think it is worth more. They are wrong. Chemical proof finds that stack burned hay has lost much of its feeding qualities so that it is inferior and not worth so much as unburned hay. It is hard to get some to believe this.

Lot No. 3, fed beet tops (hauled) and hay; final weight, 86.36; gain, 5.46; daily gain, 0.24; feed per day, beet tops, 0.0082; hay, 3.07; feed cost per 100 pounds gain, \$5.83; estimated cost at Kansas City, \$10.38; necessary selling price to break even, \$12.39.

Comment.—Pen was fed no grain but hay and tops and made cheap gains. However the lambs are not finished. Sometimes the late feeder market is so good that this pays, but sometimes not. These lambs must be finished on grain.

Lot No. 4, beet tops (pastured) and hay; final weight, 87.85; gain, 27.25; daily gain, 0.25; daily feed tops, 0.0133; hay, 1.07; feed cost per 100 pounds gain, \$4.57; estimated cost at Kansas City, \$10.20; necessary selling price to break even, \$11.83.

Comment.—Same as No. 3, except the tops were pastured. This brings up the question of fall weather. If the fall is pleasant, this is a profitable way to feed the tops, but if bad weather comes on there is loss. It's a gamble with the weather. Pastured beets give greater gain at less cost.

Lot No. 5, beet tops (pasture), corn to finish; hay; final weight, 96; gain, 34.55; daily gain, 0.32; daily feed, corn, 1.08; tops, 0.0056; hay, 1.57; total cost for 100 pounds gain \$7.79; estimated cost at Kansas City, \$11.71; necessary selling price to break even, \$12.58.

This is the only place where this ration has been tried. They were turned on beet tops during the day, then put into the dry lot and fed hay for 50 days. The last days of the demonstration they were kept in the lot and fed hay and corn. It is the same as No. 1 except for the beet tops. They gained a third of a pound a day and are the best finished so far of any, even better than the corn or barley, without beet tops.

Lot No. 6, corn, beet tops (hauled), hay; final weight, 99.39; gain, 38.41; daily gain 0.36; daily feed, corn, 0.94; tops 0.0059; hay 1.85; feed cost to secure 100 pounds gain, \$8.25; estimated cost at Kansas City, \$12.15; necessary selling price to break even, \$12.60.

Comment.—Same as Lot No. 1 except the beet tops. The tops from 1 ton of beets were equal to 52 pounds of corn and 227 pounds of hay; the tops from 1 ton of beets costing 50 cents had the feed value of \$1.85 of hay on the basis of \$8 hay, and \$2.07½ of hay on the basis of \$10 hay. It is the same as No. 1, the reliable

Nebraska ration with beet tops extra, and cuts down the cost of production per 100 pounds almost \$2. It cuts down the cost of production, makes better gains, and renders a lower selling price in order to break even.

Lot No. 7, corn, beet tops (pastured), hay; final weight, 101.72; gain, 41.10; daily gain, 0.38; daily feed, corn, 0.84; tops, 0.0091; hay 1.00; feed cost for 100 pounds gain, \$6.64; estimated cost at Kansas City, \$11.72; necessary selling price to break even, \$11.88.

Comment.—Same as No. 6, except beet tops pastured and same as No. 1 except beet tops added. We have some finished lambs here. They made over a third of a pound a day gain. However, there is the gamble with the weather in pasturing the tops.

Lot No. 8, mangels (pastured), cornfield (pastured), hay; final weight, 96.45; gain, 35.81; daily gain, 0.34; feed cost for 100 pounds gain, \$10.30; estimated cost at Kansas City, \$12.64; necessary selling price to break even, \$13.51.

Comment.—We were fortunate here in not having any loss from the cornfield. In the Arkansas valley, they have heavy losses from lambs pasturing in cornfields. The gains were similar to beet tops. They are an even bunch of lambs, but not fattened. We charged \$40 per acre for mangels and figured the corn at \$55 an acre on the basis of 65-bushel production.

Lot No. 9, corn, wet pulp, and hay; final weight, 101.93; gain, 40.55; daily gain, 0.58; daily feed corn, 0.83; beet pulp, 4.01; hay, 1.81; feed cost for 100 pounds gain, \$7.67; estimated cost at Kansas City, \$12.17; necessary selling price to break even, \$12.31.

Comment.—Here is the best finished lot we have. They are the best looking we

have. They have gained 0.4 of a pound a day. The gain per hundredweight was at a cost of but \$7.67.

The price of \$12.31 necessary to break even is less than the corn, the corn and beet tops pens. This is one of the very best rations we have. One ton of pulp is equal to 205 pounds of corn and 604 pounds of hay. With beet pulp costing \$1.90 the pulp is really worth in feeding value \$6.12. No better ration can be found than this. In northern Colorado beet pulp is recognized as one of the best feeds and the demand is so great they are cutting down the allowance per ton of beets. You who can get it should get it. We are working on a pressed pulp that can be shipped a greater distance.

Lot No. 10, corn, molasses, wet pulp, hay; final weight, 93.49; gain, 32.25; daily gain, 0.31; daily feed, corn, 0.62; pulp 2.98; molasses, 0.46; hay, 1.69. Feed cost per 100 pounds gain, \$8.10; estimated cost at Kansas City, \$11.53; necessary selling price to break even \$32.71.

Comment.—Same as No. 9, except the molasses added. We have not yet learned how to feed molasses to the lambs. It is a good ration if we can figure out the right proportion. This lot started out well, made fine gains and we sought to increase the molasses so as to cut down the corn and got the lambs off feed and they never came back. When corn is high, it is a good ration to cut down the corn by using molasses, if the right proportion can be secured to prevent their going off feed. Molasses is used in steer feeding with great success. We may find that cottonseed cake with the molasses will be the thing needed to counteract the effect of the molasses.



Leveling land with tractor on the Newlands project, Nevada



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor, New Reclamation Era



Food Facts

THE outstanding reason for malnutrition among American children is bad food habits. In no other country is the child allowed to decide for himself what he will or will not eat as he does here. Of course, there are some parents who do not provide the right food for their children because of lack of knowledge of food values or failure to understand the importance of the information at hand. In any case bad food habits, whether based on the child's choosiness or the parent's lack of information, can be corrected only through education of the parents. And this means education in the right direction—in what are the proper foods for children and how can they be trained to eat wholesome foods.

The vitamin content of milk depends largely on the vitamin content of the ration of the cow. Milk richest in vitamins is obtained from cows that have plenty of green feed and sunlight. Cows kept in their stalls and fed largely on dry feeds and cured hay produce milk that is relatively low in vitamins.

Milk Habit for the Child

"Mother, may I have a glass of milk?" Very likely the child who stops his mid-morning play, or rushes in after school, if he is old enough to go to school, thinks of a glass of milk because he is thirsty. But he has the milk habit, and his mother, who thinks of milk as a good food for body-building, undoubtedly fills his glass without comment, and rejoices inwardly that the child wants it.

Children who have been accustomed to a normal amount of milk from babyhood like it and expect it several times a day, with their meals, and occasionally between them. Other essential foods should also be included in their diet, particularly fresh fruits and vegetables, meat, eggs, whole grain cereals, and butter or cream. But with the milk habit firmly established, the mother can give more attention to cultivating a taste for these other foods that make up the best diet for the child.

Children reveal in their food habits the training they have had, or the lack of it. The child who has been trained to take milk as a matter of course has a big

advantage over the one who has been allowed to say, and to make himself believe, "I don't like it." For milk is one of the best foods to supply him with calcium for building strong bones and good teeth, as well as other important substances. There are ways of getting milk into the diet even in such cases, through milk soups, puddings, flavored drinks, and so on, but the wise mother prevents this problem from arising by her sensible training while the child is young and passing from the bottle to the solid food stage.

An Extra Meal Good for an Active Boy

The active growing boy sometimes needs more calories in his daily ration than his father or mother, if they are people of more or less quiet habits. His food must be wisely chosen to supply the elements he needs for developing his body and creating his apparently inexhaustible energy. A mid-morning or mid-afternoon snack consisting of a fruit drink, or milk, and perhaps a lettuce and whole wheat bread sandwich is a good thing for the boy, especially if he has just used up most of the fuel provided by the preceding meal in playing baseball or on a visit to the nearest swimming hole. Food of this kind given rather as an extra meal than as "eating between meals" will not dull his appetite for the next family gathering at the dinner table.

Suggestions for Ironing

There's a world of difference in the way one feels at the end of a day's ironing, depending on whether you have used your head to save your back in managing the work, and on whether you have arranged your equipment in the best possible way for saving needless motions. For example, can you stand—or still better sit—in one place and reach both the basket of sprinkled clothes and the clotheshorse that airs the finished work? Do you get everything ready before you begin, so that when once you get "into the swing" of ironing, you can go straight ahead without interruption? And, speaking of interruptions, do you plan to do the ironing at the hours least subject to them? It's bad economy to heat up the irons, or



A typical project boy

the iron, as the case may be, and then iron a little while, with a stop in between for something else, so that the irons get cold and possibly the clothes get too dry. Much fatigue can be avoided also, in connection with ironing, if you have previously given thought to the selection of the family clothing and the household linens to eliminate all unnecessary ironing. The flatter and plainer the garments, the easier they are ironed; and the family will accept rough dry, smoothed out sheets, turkish towels, crêpe underwear, and paper table linen if they realize that by doing so they are greatly lessening the time you have to spend ironing.

The first thing to think of is the height and location of your ironing board with reference to your own height and the way you exert pressure from your shoulder, and also with reference to a good light on the work. Almost equal in importance is the smooth padding and covering of the board itself. Much has been said of the convenience of the built-in ironing board and the electric iron. The illustration shows a good arrangement for both of these conveniences in connection with a breakfast alcove in a Utah farm home. The folding ironing board is built into a small space in the wall. Light from the alcove falls over the worker's shoulder on the ironing board, and the near-by table and bench make it possible to sprinkle the clothes or sort the finished pieces easily, or pile up small flat work, like handkerchiefs or table napkins. Sprinkling is done more evenly and quickly, it may be said in passing, if you use a rubber spray head on a medium-sized bottle, or a clean round whisk broom. There should be a folding clotheshorse within reach of the worker for airing and drying the finished work, or some other convenient arrangement. Much of the ironing can be done sitting down if a high stool is provided.

The electric iron is one of the best labor-saving devices now available. Buy from a reputable company equipped to make any needed repairs, and when purchasing see that the voltage corresponds to that supplied you by the local power plant. With proper care an electric iron will last a long time. Avoid dropping it, or pulling the plug out by the wire at either end, as this is apt to break the fine wires through which the connection is made. Always disconnect the iron when you are through using it, even for a short time, and stand it on end to cool. Store it in a clean dry place. Examine the cord frequently for breaks. Sometimes these can be repaired with insulating tape. Irons put away for any length of time should be greased.

It is estimated that there are more than 300,000,000 hens in the United States on farms and in poultry plants.



Built-in ironing board

Mixing Pleasure With Business

The home makers on the Riverton project in Wyoming are banded together by a Home Economics Club and report has been received of the March meeting of the club.

These meetings are held monthly in the different members' homes on the project.

Mr. H. D. Comstock, superintendent of the project, was invited to address the meeting, which he did and took advantage

of the opportunity to explain the various factors which go into the administration of the affairs of the project. Both sides could not fail but profit by such a better understanding brought about by an enlightening talk to a progressive group of women.

A novel feature of the gathering was a demonstration of simple desserts. Each member brought a dessert, and the recipe, telling the cost of making and the number of people it would serve. These desserts were used as refreshments at the conclusion of the meeting.

Financial Assistance to Settlers

DR. H. L. KENT, president of the New Mexico College of Agriculture and Mechanic Arts, in a recent letter to Commissioner Mead, makes the following statement:

"I think you are quite right in your statement that some form of loan to settlers to enable them to drag or level their land is about the most satisfactory thing that can be done at the present time.

"I think the farmer who has had no experience on reclamation projects little appreciates the great expense necessary to putting land in condition to irrigate satisfactorily. I have been having a little experience myself this spring. I bought 71 acres of land which had been partly leveled and had had a little work done on it. The man who bought it first had not been able to put the money into it that should have been put into it, and conse-

quently the farm was only partly leveled. It was smooth or relatively smooth in the first place.

"The first purchaser gave the first crop to a man to do some leveling and washing. Consequently the farm was only partly leveled and he got no returns the first year, and he paid the taxes and water charges. The second year he did not get enough off the land to make these payments even though he spent nearly \$100 grubbing and some additional money on ditches, etc. In addition to the work my tenant is doing this year I shall have to spend, I estimate, something like \$400. A part of this is to put in ditch boxes of course, but it is all necessary to irrigation. I anticipate that another year I shall have to spend fully as much in doing additional leveling, and I doubt whether that will put the farm into good condition."

Colorado River Development Reported Favorably to Congress

Both Senate and House Committees on Irrigation and Reclamation report favorably on bills providing for the construction of works for the protection and development of the lower Colorado River Basin

ON March 15, 1928, the Committee on Irrigation and Reclamation of the House of Representatives made a favorable report on H. R. 5773, a bill to provide for the development of the Colorado River Basin. The report considers the various problems under nine heads, as follows:

1. The Colorado River and its characteristics, and the Imperial Valley.
2. The Boulder Canyon project—its development and plan.
3. The Colorado River compact—the upper and lower basins.
4. Flood control.
5. All-American canal.
6. Domestic water.
7. Power.
8. Authority of the Government.
9. Form of bill.

The conclusions of the committee are as follows:

This bill should be passed because—

First. Congress should no longer risk a flood catastrophe to Imperial Valley—a catastrophe which further delay only courts.

Second. Reclamation possibilities in the lower basin should be safeguarded and taken care of before it is too late. Unless something is done, the river will be acquired for power development exclusively. Mexico is constantly building up added claims to its waters.

Third. The Mexican situation must be met. It is not sound policy to allow a condition to continue by which that country may and will go on using more and more water from the river, and this at the expense of existing and future irrigation in the United States.

Fourth. The Government should aid its people to secure their necessities in the way of domestic water supply, where it can do so, as here, without cost and as an incident in carrying out other Federal purposes such as river regulation and reclamation.

Fifth. It will convert a natural menace into a national asset.

Sixth. A financial scheme is presented by which the development will be completely prefunded, thus fully protecting the Federal Treasury and the general taxpayer.

Seventh. It settles in large part water rights between States in the sensible and practical way, substituting interstate agreements for interminable litigation and controversy. Further delay points to the

latter untoward results and the disintegration of the plan of settling water rights by interstate compact.

FAVORABLY REPORTED BY SENATE COMMITTEE

On March 20, 1928, the Committee on Irrigation and Reclamation of the Senate reported favorably on the bill, S. 728, with a discussion of the various problems under the following six heads:

1. Generally of the project, its development, and plan.
2. Flood control and river regulation.
3. All-American canal and water supply.
4. Domestic water.
5. Power.
6. Financial soundness of project.

The conclusions of the committee are as follows:

This is a project which should appeal both to the imagination and the hard business sense of the American people. A mighty river now a source of destruc-

tion is to be curbed and put to work in the interest of society.

The people of the Southwest are not asking of the Government this great public improvement as a gift. All they ask is that the Government lend its good offices to make this development possible. Established communities and responsible agencies will bind themselves to return to the Government all moneys expended. The varied interests concerned with the development make a centralized agency necessary. The Government is the logical agency. The beneficiaries assume all the financial obligations. Nor is this quite all. After the development is paid for the Government still will retain ownership and control of the dam for such use as the Congress may deem wise and just.

It is a great constructive improvement, not experimental, sound financially, well considered, shaped in the public interest, one the consummation of which will be a source alike of national pride and advantage.

Contract Between United States and Fort Shaw Irrigation District Confirmed by Supreme Court of Montana

UNDER date of November 10, 1926, the United States entered into a contract with the Fort Shaw Irrigation District, embracing a part of the Sun River project, Montana, for the transfer to the district of the management of the irrigation works of the Fort Shaw division and for the payment of construction charges on a crop production basis.

The Board of Commissioners of the district, as permitted by the irrigation district laws of the State, filed a petition in the District Court of Cascade County for the confirmation of the contract. Objections were made by three landowners to the effect that their lands were not properly included in the district. The district court overruled the objections and entered judgment confirming the contract. The objectors then appealed to the Supreme Court, which in the case of Commissioners of Fort Shaw Irrigation District *v.* Ward et al., decided December 29, 1927, and reported in 261 Pacific, 962, upheld the decision of the lower court. The decision of the lower court was,

however, ordered to be amended so as to exclude from the assessable area of the district certain lands of the objectors for which they had a vested right under contracts with the United States.

The court held that the objection as to the improper inclusion of the objectors' land in the district came too late, as this matter had been judicially passed upon in a previous suit to establish the due organization of the district. In the previous suit the court had entered a judgment finding that the proceedings to establish the district and fix its boundaries were regular, and this judgment could not be attacked collaterally, in the absence of fraud, which was not alleged.

THE cold backward season on the Yakima project has been very favorable for fruit and there has been no frost damage. Prospects are good for a heavy fruit crop on both the Sunnyside and Tieton divisions.

Reclamation Organization Activities And Project Visitors

DR. Elwood Mead, Commissioner of Reclamation, after investigating the causes of the failure of the St. Francis Dam, Calif., and inspecting the Stony Gorge Dam, Orland project, returned to the Washington office on April 6.

R. F. Walter, chief engineer, conferred recently with Commissioner Mead in Los Angeles, and on his return to the Denver office inspected the Yuma, Rio Grande, and Carlsbad projects.

Maurice G. Ricker, photographer in the Washington office, left on April 9 for a trip to North and South Carolina to obtain still and motion pictures of agricultural conditions in connection with the investigation by the bureau of opportunities for planned rural settlement in the Southern States.

Milton G. Devitt has been appointed principal engineering draftsman and assigned to the designing section of the Denver office.

W. W. Johnston, associate reclamation economist; C. C. Wilburn, of Jerome, Idaho; and J. L. Driscoll, of Boise, have completed the field work in connection with the appraisal of excess area lands in private ownership in American Falls Reservoir District No. 2, Minidoka gravity extension unit.

Recent visitors to the Milk River project included C. D. Greenfield, and I. D. O'Donnell, agricultural development agents of the Great Northern Railway; E. E. Roddis, district counsel; W. A. Lamb, district engineer of the United States Geological Survey; and C. C. Carey, of Winston Bros. Construction Co., Minneapolis, Minn.

The Great Northern Railway has furnished the services of I. D. O'Donnell, working through the Montana State Extension Service, to assist in the agricultural development of the Milk River project during the coming season. Mr. O'Donnell will promote better diversified farming and particularly sugar beet culture.

D. A. Banks, former State Treasurer of Idaho, was on the Minidoka project

Water Supply March 31, 1928

The distinctly unfavorable conditions for 1928 run-off, so generally prevalent at the end of February, have very materially improved. In the Sierra Nevada regions, where such conditions were worst, the heaviest storm in many years resulted in a rapid accumulation of storage and a good snow cover that will aid late season run-off. Lesser, but nevertheless heavy storms, throughout the Western States, improved the situation in other localities. At the end of the month reservoirs are generally well filled or certain of filling and prospects for natural flow are at or near average. The only Federal project likely to experience a water shortage is the Okanogan project, but even there conditions are much better than the average for the past 10 years.

recently to submit a proposal to the Minidoka Irrigation District to handle the trapping of muskrats on the system. Mr. Banks is interested in a fur farm in Oregon.

The committee of nine, an organization to promote harmony and advise with the Snake River water master on matters of policy in river administration, was chosen recently by the Snake River Valley water users, with the following membership: Frank A. Miller and Ephraim Ricks, representing the North Fork area; John Hart, W. O. Cotton, John E. Kelly, and E. V. Berg, representing the central or

Aid for Settlers Endorsed by Conference

Among the resolutions adopted by Western Regional Conference of the American Farm Bureau Federation, held recently at Las Cruces, N. Mex., is the following, indorsing the bills introduced in Congress providing for aided and directed settlement on the reclamation projects:

Resolved, That we heartily indorse the plan as outlined in the Winter bill, for the rendering of assistance by the Government to settlers on Federal reclamation projects, and we urge our Senators and Representatives in Congress to vote for said bill and render every aid in securing the passage of the same.

Idaho Falls area; and R. E. Shepherd, T. M. Baird, and E. B. Darlington, superintendent of the Minidoka project, representing the lower valley.

E. C. Koppen, H. R. Robbins, and H. L. Holgate, formerly connected with the Bureau of Reclamation, were recent visitors on the Klamath project.

R. K. Tiffany, State Supervisor of Hydraulics, Washington, was a recent visitor on the Yakima project.

Associate Engineer E. T. Erickson and Supt. R. C. E. Weber, Orland project, spent several days at San Francisco in conference with District Counsel Coffey and Oliver P. Morton, special assistant to the Attorney General, in connection with the preparation of the Government's opening brief in the Stony Creek water right adjudication suit.

E. E. Roddis, district counsel, spent two days on the Lower Yellowstone project, appearing before the county commissioners of Richland County relative to obtaining the payment of interest and penalty on water charges which had been withheld by the county. As a result of the conference the county has turned over about \$4,800 to the irrigation district.

Sr. Adolfo Orive Alba, civil engineer of the Escuela Nacional de Ingenieros of Mexico City, arrived recently on the Rio Grande project, where he is making a study of irrigation works. He expects to visit a number of irrigation projects.

Engineer J. R. Iakisch was on the Shoshone project for 10 days in connection with the drainage program for the Garland division for 1928. Assistant Engineer Horace V. Hubbell left the project to take charge of drainage work on the Belle Fourche project, his duties being assumed by I. B. Hosig, associate engineer.

Mrs. Jennie T. Davis, formerly employed as auditor in the accounting division, was a recent visitor at the Washington office, renewing her acquaintance with former associates.



General view, looking upstream, of Gibson Dam, Sun River project, Montana

Colorado River Basin Map Available For Sale

The Department of the Interior through the Bureau of Reclamation has just issued an attractive map of Colorado River Basin showing in colors the Boulder Canyon and other reservoir sites, the irrigated areas and possible extensions of the same,

Tree Planting on the Reclamation Projects

The recent celebration of Arbor Day lends interest to a publication on "Tree Planting on the Reclamation Projects," just issued by the Bureau of Reclamation.

One of the principal criticisms about irrigation projects is that there is a lack of trees. People coming from the East or Central States, where trees are plentiful and of great variety, note especially the scarcity of trees on the projects.

This booklet takes up each Federal irrigation project in order and describes the varieties of trees best suited to each locality, from the standpoints of shade, ornamentation, windbreaks, and the wood lot. A chapter is devoted to planting suggestions and another to Arbor Day on the projects.

Copies of the illustrated booklet may be obtained on request by addressing the Commissioner, Bureau of Reclamation Washington, D. C.

national parks and monuments, power plants and power sites and the proposed Los Angeles aqueduct.

The scale of the map is approximately 42 miles to an inch. It covers a sheet 20 by 22 inches. This publication is known as map No. 23000 and the price is 25 cents per single copy and 15 cents per copy in lots of 25 or more. It may be obtained from the Bureau of Reclamation, Washington, D. C.

Remittances should be forwarded with the request, and should be by postal money order, express order, or New York draft, payable to the special fiscal agent, Bureau of Reclamation. Currency may be sent at owner's risk. Stamps will not be accepted.

Distribution of Crops On the Projects, 1927

Analysis of the statistics of crops grown in 1927 on the Federal irrigation projects under the Bureau of Reclamation, shows that alfalfa leads from the standpoint of acreage, being grown in that year on 438,675 acres or 31 per cent of the total cropped area of 1,431,560 acres. This crop was followed by wheat, 186,571 acres, representing 13.3 per cent of the total cropped acreage, and cotton, 178,875 acres, which accounted for 12.5 per cent.

From the standpoint of value, cotton led with a crop value of both lint and seed of \$16,705,727, or 23.2 per cent of the total value of \$72,047,200 for all crops,

followed by alfalfa hay, valued at \$12,081,678, or 16.8 per cent of the total, and garden truck, valued at \$7,707,525, or 10.7 per cent. Sugar beets were valued at \$5,843,489, apples at \$5,294,092, and wheat at \$5,110,980.

The accompanying table gives the acreage, value, and value per acre of the crops grown in 1927, by large groups.

Crop	Acreage cropped	Value	Value per acre
Cereals.....	348,018	\$8,077,789	\$23.21
Other grain and seed..	47,441	1,697,026	35.77
Hay and forage.....	838,184	16,707,549	19.93
Vegetables and truck..	118,844	13,027,469	109.61
Fruits and nuts.....	46,332	9,213,536	198.86
Sugar beets.....	61,963	5,843,489	94.30
Cotton.....	178,875	16,705,727	93.40
Miscellaneous.....	54,148	368,635	25.30
Duplication.....	275,225		
All crops.....	1,431,560	\$72,047,200	50.33

¹ Included 12,980 acres, statistics for which by individual crops were not compiled.

² Includes \$405,980, statistics for which by individual crops were not compiled.

Breeding is a valuable means of increasing production of milk and butterfat in dairy cows and of eggs in poultry. With meat animals, improved breeding will hasten maturity and improve quality in general.

1927 Crop Values Total \$133,207,210

The total value of the crops grown in 1927 on the Federal irrigation projects under the Bureau of Reclamation and on adjacent land served with water under Warren Act or other water service contracts from the Government irrigation works amounted to \$133,207,210 compared with \$110,414,940 in 1926, or an increase of \$22,792,270. The total irrigated area in 1927 was 2,527,105 acres compared with 2,508,210 acres in 1926. The total cropped area in 1927 amounted to 2,504,046 acres (including 104,750 acres cropped without irrigation and producing crops valued at \$1,061,750) compared with 2,311,060 acres in 1926 (including 32,660 acres cropped without irrigation and producing crops valued at \$295,280).

The difference between the area irrigated and the area cropped is accounted for largely by land in young alfalfa and in young orchards. The increase in the value of crops is due largely to better prices, particularly for cotton on the southwestern projects.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burfew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlshad.....	Carlshad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	E. E. Chahot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	Erle W. Shepard.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Oriand.....	Oriand, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....	C. O. Cragin.....	.....	.....	.....	.....
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompaggre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philehaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gihson Dam.....	Augusta, Mont.....	Ralph Lowry ¹⁴	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Oriand, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹⁵	C. B. Funk.....	.....	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Valley Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Albuquerque, N. Mex.....	.....	Middle Rio Grande conservancy district.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	.....
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.



SPILLWAY SECTION



WEST SIDE FROM BUTTRESS NO. 25 TO 38 INCLUSIVE



DOWNSTREAM SIDE AS SEEN FROM POINT NEAR NORTH END



UPSTREAM FACE AS SEEN FROM POINT NEAR SOUTH END



UPSTREAM FACE AS SEEN FROM POINT NEAR NORTH END

STONY GORGE DAM

MARCH 21, 1928

NEW RECLAMATION ERA

VOL. 19

JUNE, 1928

NO. 6



Photo by Lucier, Powell, Wyo.

SHOSHONE DAM AND RESERVOIR, SHOSHONE PROJECT, WYOMING



*THE preservation of the
farming business on a
basis which will main-
tain on the land a rural
population that may continue to con-
tribute to the public welfare something
more than an adequate food supply is
essential to the permanent
well-being of this
country*



NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, 75 cents a year

HUBERT WORK
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

June, 1928

No. 6

Interesting High Lights on the Federal Reclamation Projects

AT Stony Gorge dam, Orland project, concrete placed during April amounted to 3,013 cubic yards, bringing the total to the end of the month to 38,148 cubic yards, or about 88 per cent of the concrete for the whole structure. At the end of the month the dam was 90.2 per cent completed.

THIS year's planting of cotton on the Yuma project will be approximately 32,000 acres, or an increase of 31 per cent over that of last year.

THE Southern Pacific Co. is double tracking its system west of Yuma, and is endeavoring to complete the first 10 miles before the cantaloupe crop starts moving out of Imperial Valley during the latter part of May. Fifteen acres on Yuma Mesa were leveled during the month and were ready for water.

A local firm on the Grand Valley project is offering contracts for raising pinto beans at a guaranteed price of 4 cents a pound for October delivery.

CONTRACTS have been signed for planting about 3,600 acres of sugar beets on the Minidoka project this season. About half the acreage has been planted. Only one of the sugar mills of the Amalgamated Sugar Co. in the lower Snake River Valley will be operated this year, and it is expected that the Burley factory will be the one designated.

THE Cassia County Turkey Anti-Theft Association was organized recently at Burley, Minidoka project. The purpose of the association is to adopt certain specified brands for their birds, to have them registered, and jointly to protect the members against theft of turkeys. A similar organization was formed recently in Minidoka County.

APPROXIMATELY 5,200 acres of sugar beets have been contracted by the Chinook factory, Milk River project, 3,500 acres on the Chinook division, 1,200 on the Malta and Glasgow divisions, and 500 outside the project. This acreage guarantees the continuation of factory operation this season. At the end of the month about 25 per cent of the acreage had been planted.

THE Great Northern Railway has started construction of the Saco-Turner branch line across the Milk River project. The completion of this line will open for settlement 150,000 acres of dry-farm land in the northern portion of Blaine and Phillips Counties.

CONTRACTS have been signed for about 6,600 acres of sugar beets on the Lower Yellowstone project, or an increase of about 60 per cent over than of last year. At the end of the month about 2,000 acres had been planted.

THE new Richland County courthouse at Sidney, Lower Yellowstone project, was dedicated on May 4 with appropriate ceremonies. The building was erected at a cost of about \$125,000 and is a thoroughly modern structure in every respect.

THE Holly Sugar Corporation in Wyoming report that 22,000 acres of sugar beets have been contracted, giving the Torrington factory of the company on the North Platte project what is said to be the largest acreage of beets in the United States.

WORK has begun by the Chicago, Burlington & Quincy Railroad Co. on the construction of a new station at Torrington, Wyo., on the North Platte project. A new station is also being constructed at Minatare, Nebr.

ABAND, composed of boys and girls of the Irrigon Grade School, West Extension Irrigation District, Umatilla project, has built up an enviable reputation by its concerts in the project towns. As a result it has been invited to play at the State fair to be held at Salem, Oreg., the latter part of the summer. Much of the credit is due to the efforts of Prof. B. E. Maske, principal of the school.

ABOUT 60 of the settlers on the Tule Lake division of the Klamath project have organized the Tule Lake Community Club. Herbert D. Newell, project superintendent, and C. A. Henderson, Klamath County agricultural agent, were elected honorary members.

THREE new settlers leased farms on the Belle Fourche project during the month, and a large number of inquiries concerning settlement opportunities have been received. A number of farm buildings are in process of erection.

COLLECTIONS for water-right charges on the Tieton division, Yakima project, amounted during the month to \$51,454.09, or \$2,660.58 more than for the same month in 1927.

THREE prospective entrymen and one prospective purchaser of land visited the Riverton project during the month, two of whom made application for homestead entry.

THERE will be a considerable increase in the bean acreage on the Huntley project this season, owing to the favorable contract offered by the D. M. Ferry Seed Co. for growing seed beans of 4½ to 5 cents a pound, depending on the variety grown. A car of seed has been unloaded at Worder for distribution to the farmers.

Design of the Owyhee Dam, Owyhee Project, Oregon-Idaho

By J. L. Savage, Chief Designing Engineer, Denver Office, Bureau of Reclamation

FROM an engineering standpoint the Owyhee Dam, to be constructed on the Owyhee project in eastern Oregon, is the most outstanding dam undertaken to date by the Bureau of Reclamation. With a height of 405 feet at maximum section and a total height of 520 feet above the lowest concrete in the foundation cut-off, this dam is likely to stand as the highest dam in the world until the great Boulder Canyon Dam is constructed.

The Owyhee Dam will be of the concrete arch-gravity type, with about three-fourths of the water load carried to the abutments by arch action and one-fourth carried to the base by gravity cantilever action. The radius of the upstream face of the dam at the top will be 500 feet and both faces will be concentric about a common center. The top thickness will be 30 feet and the bottom thickness at maximum section will be 265 feet. The upstream face will be vertical for the top 75 feet and below this will have a batter of 0.05 to 1. The downstream face will be generally on a slope of 0.626 to 1. The accompanying drawing shows the general plan, elevation, and sections of the dam in addition to the principal sections through the diversion and spillway tunnel and other general information.

PRELIMINARY INVESTIGATION

The preliminary investigation of the "Hole in the Ground" reservoir site and the Owyhee damsite included five different geological examinations by three eminent geologists and the careful consideration of three eminent consulting engineers. A total of nearly \$100,000 was expended for the preliminary investigations, including the cost of test drilling the damsite. Test holes to the number of 73 and to a total length of 7,800 feet (nearly $1\frac{1}{2}$ miles) were drilled to disclose the character of the formation rock on which the dam will be constructed.

GEOLOGY OF RESERVOIR BASIN

With water depths in the reservoir reaching a maximum of 350 feet at the dam and with not less than 270 feet of dead storage in the reservoir at all times, the geology of the reservoir site was given particular study. The greatest portion of the reservoir basin is in prebasaltic tuff which is practically impervious. This portion includes all of the reservoir nearest to the dam where water depths are great. The upper end of the basin where water depths are small is in practically tight

formations of conglomerate, sandstone, shale, and tuff. The portion near the mouth of Dry Creek is in Columbia River basalt, which constitutes the only portion where any considerable leakage might occur. However, the geological opinions indicate that no serious leakage is to be expected through this formation owing to the great distance (several miles) to an outlet with various possibilities for stoppage along the way.

GEOLOGY OF DAMSITE

The test holes show the foundation material to consist of sand, gravel, cobbles, and boulders to a maximum depth of 60 feet, below which rhyolite is found of the same character as that exposed in the canyon walls. The rhyolite extends to a depth of 170 to 215 feet below the water surface and is bedded on pitch-stone agglomerate. Tuff of unknown depth is found below the agglomerate. All of the geological and engineering opinions have agreed that the foundation rock is suitable for the construction of the dam.

The most serious flaw in the damsite is the presence of a shattered zone or fault crossing the damsite at about the center of the river canyon. This shattered zone was first disclosed by the core drilling at the damsite and later by an open test pit located about 1,450 feet downstream from the damsite, where the fault leaves the river canyon.

The shattered rock is confined between two seams of clay gouge spaced about 10 feet apart. These seams are described by the geologists as indicating movement along fault lines. The rock between these clay-gouge seams is broken rhyolite composed of fragments generally under 6 inches in their longest dimension and occasionally reaching 14 inches in length. Although minutely shattered the fragments retain their original relative position and have not been rotated. This shattered zone is believed to extend through the stratum of rhyolite to agglomerate or tuff and it is anticipated that considerable leakage would occur through this broken rock if left in place. The geological opinions have indicated that the shattered zone probably stops at the less brittle formation of agglomerate below the rhyolite and in any case at the tuff. It is therefore anticipated that the fault zone cut-off will extend entirely through the rhyolite and that it will terminate on either the agglomerate or the tuff.

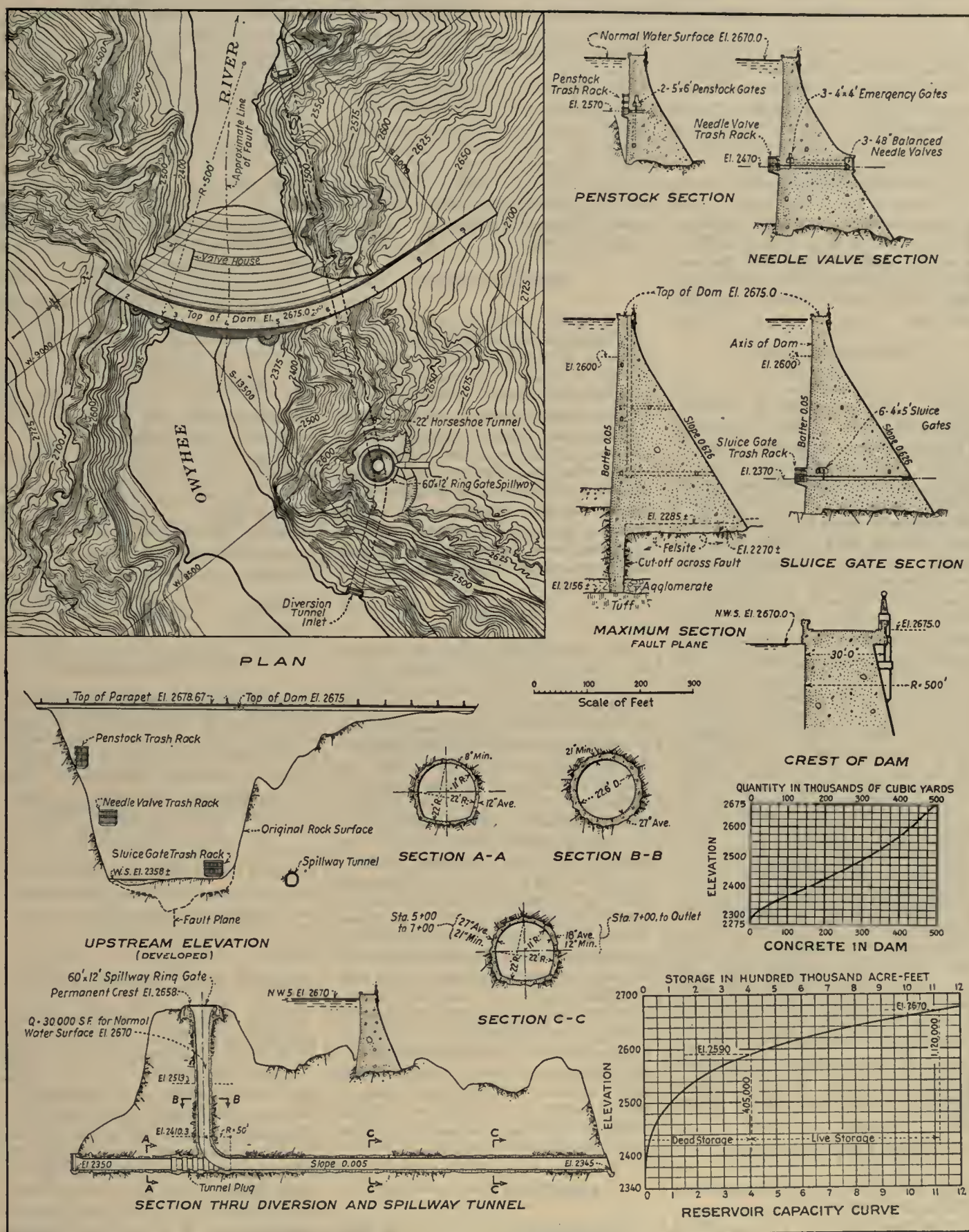
PRELIMINARY DESIGNS AND ESTIMATES

Before adopting the arch-gravity type of dam careful preliminary designs and estimates were prepared for five different alternative types, including a light arch section, an intermediate arch section, a heavy arch section (arch-gravity section), a straight gravity, and a slightly curved gravity dam. Based on these studies the heavy arch or "arch-gravity section" was adopted. This type is in reality a section which if straight and not subject to uplift pressures would figure safe as a gravity dam with the resultant line of pressure passing through the downstream one-third point and with a sliding factor of 0.65 or less at all elevations. While this heavy-arch dam is in no sense a gravity section it has been called an arch-gravity dam for the reason that the loads are carried partly by arch action and partly by gravity action.

In all of these studies, including both the arch and gravity sections, uplift pressures have been assumed to act over the whole area of the base, varying from full hydrostatic pressure at the upstream face to one-half hydrostatic pressure at the drainage wells, and diminishing uniformly thence to zero or tail-water pressure at the downstream face. The vertical components of water pressure on the upstream and downstream faces have been included in the cantilever loads.

The cantilever studies include the effect of convergence of the sides and the shear and moment deflections of the foundation. The arch studies include the effect of shear, rib shortening, and abutment deflections due to thrust, moment, and shear. The formulæ for calculating the yielding of foundation and abutments are taken from the paper "Über die berechnung der fundament deformationen" by Dr. Fredrik Vogt. The effects of yearly temperature changes were included in the preliminary computations. The final studies will include consideration of the effect on the stresses of the setting heat remaining in the concrete at the time of grouting the joints. It is also intended to study in the final computations the effect on the stresses of saturation of the concrete.

By giving the cantilever elements an initial water load before grouting the vertical contraction joints, which can be accomplished in the normal procedure of filling the reservoir, it may be possible to better distribute the water load between the arch and cantilever elements, thereby reducing the arch stresses, which



Owyhee Dam. Plan, elevation, and sections

are the maximum stresses. The system for grouting the vertical contraction joints has been designed with this procedure in mind, and the specifications will make provision for beginning storage in advance of completion of the dam or the postponement of grouting until after the completion of the dam as required to control the load conditions at the time of grouting the contraction joints.

The load distribution between the arch and cantilever elements is found by the trial-load method which has been in use by the Bureau of Reclamation engineers for several years. This method has been improved recently by the use of unit loads which have reduced the work materially.

GATE INSTALLATION

The gate installations in the dam include sluice-gate outlets at elevation 2370, needle valve outlets at elevation 2470 and power penstock outlet at elevation 2570. High water in the reservoir is at elevation 2670 and the top of dead storage is at elevation 2590. The sluice-gate outlet will consist of three outlet conduits, each conduit being controlled by two 4 by 5 foot cast-iron sluice gates, arranged in tandem alignment and operated by oil-pressure cylinders from a gallery in the dam. The needle-valve outlet will consist of three cast-iron lined conduits, each conduit being controlled by a 48-inch balanced needle valve and a 4 by 4 foot high pressure emergency gate. The needle valves will be mounted at the downstream end of the conduits and the emergency gates will be located near the upstream face of dam. Operation of emergency gates will be by oil-pressure cylinders from a gallery in the dam. A 4-ton traveling crane will be installed in the valve house to serve the needle valves. The power penstock outlets will consist of two 6-foot conduits, each controlled by a 5 by 6 foot cast-iron emergency gate. The gates will be operated by oil-pressure cylinders from a gallery near the upstream face of the dam. The outlet conduits will bend downward and enter the canyon wall within the base of the dam, terminating in a common penstock tunnel at a distance of about 50 feet from the base of the dam. The penstock tunnel and power plant are not to be constructed at the present time.

TRASH-RACK STRUCTURES

All of the different outlets from the dam are protected by trash-rack structures of the same general design. These consist of a reinforced concrete semicylindrical structure, carrying rack bars of structural steel.

The bars are 6 by $\frac{7}{8}$ -inch steel bars spaced 6 inches on centers in the sluice-gate and needle-valve outlet and 6 by $\frac{1}{2}$ -inch steel bars spaced $3\frac{1}{4}$ inches on centers in the power penstock structure. The rack velocities in sluice-gate outlet will vary from 2.1 feet per second under a 50-foot head to 5.3 feet per second under a 300-foot head. In the needle-valve outlet the rack velocities will vary from 0.9 foot per second under a 25-foot head to 2.6 feet per second under a 200-foot head. The rack velocities for the power outlet will be less than 1 foot per second.

DIVERSION TUNNEL

The designs provide for a 22-foot diameter horseshoe tunnel 1,005 feet long, for diversion of the river during construction, the greater part of the tunnel being utilized for the permanent spillway. The tunnel intake is designed with provision for temporary closure utilizing headwall grooves, and keyways are provided upstream from the spillway shaft for final closure by means of a concrete plug. Studies of the capacity curve of the diversion tunnel as compared with the maximum river discharge of record indicate a height of cofferdam of about 60 to 75 feet.

SPILLWAY

The spillway will consist of a vertical shaft connecting with the diversion tunnel at a point 240 feet below the tunnel intake. The spillway shaft will be controlled by a 60 by 12 foot spillway ring gate operating in an annular pressure chamber formed in the spillway crest structure. The ring gate is a floating type crest similar in operation to the drum gate but designed with much better hydraulic conditions for flow into a vertical spillway shaft. The gate will be of structural steel construction embodying 12 shop riveted segments, which are riveted together in the field to form the complete ring gate. The operation of the ring gate will be controlled automatically by a needle-type valve in the same manner as the recent drum gate installations of the Bureau of Reclamation. The application of the ring gate for spillway control is believed to be new and the engineers who developed this device are making application for patents on the gate and some of the control features. This type of gate effected a material saving in cost as compared with the usual drum-gate installations.

PRINCIPAL ITEMS OF WORK

The construction of the Owyhee dam will involve the following principal items of work:

Excavation, earth and loose rock-----cubic yards--	135, 000
Excavation, solid rock--do----	70, 000
Excavation, all classes, spillway shaft---cubic yards--	15, 500
Excavation, all classes, diversion and spillway tunnel-----cubic yards--	35, 000
Drilling grout holes,-----linear feet--	11, 000
Drilling drainage holes,-----linear feet--	7, 000
Concrete in dam--cubic yards--	490, 000
Concrete in fault zone--do----	17, 600
Concrete in spillway inlet and outlet, spillway shaft, and tunnel lining--cubic yards--	12, 000
Concrete in needle-valve house, trash-rack structures, etc-----cubic yards--	825
Placing reinforcing steel,-----pounds--	675, 000
Installing pipe and fittings for grouting radial contraction joints-----pounds--	115, 000
Installing and painting gates and valves with appurtenant metal work-----pounds--	1, 760, 000
Installing and painting structural steel ring gate with appurtenant metal work-----pounds--	440, 000
Installing and painting trash-rack steel-----pounds--	183, 000

CONSTRUCTION RAILROAD

A railroad for transporting construction materials to the dam site is already under construction, having been contracted to the General Construction Co., of Seattle, Wash., for completion November 21, 1928. This railroad will run from its junction with the Homedale branch of the Oregon Short Line Railroad near Dunaway Siding, Oreg., to the dam site, a distance of about 24 miles. The railroad will be of standard gauge with 70-pound rails, having a maximum grade of 0.5 per cent toward the dam and 1 per cent from the dam.

ELECTRIC POWER FOR CONSTRUCTION

Electric power for construction purposes will be available at the dam site at 2,300 volts. Arrangements are being made with the Idaho Power Co. to transmit power generated at the Government power plant at Black Canyon Dam over the company lines as far as the Ontario-Nyssa substation and from this point the Government is constructing a 66,000-volt single-circuit wood-pole transmission line to the dam site. A 2,000-kva step-down substation will be provided at the dam site and power will be sold to the con-

(Continued on page 85)

Silt in the Colorado River and its Relation to Irrigation

THE Department of Agriculture has recently issued Technical Bulletin No. 67, entitled "Silt in the Colorado River and Its Relation to Irrigation," by Samuel Fortier, senior irrigation engineer, and Harry F. Blancy, associate irrigation engineer, of the Division of Agricultural Engineering, Bureau of Public Roads. The authors state that it is only a preliminary report, which does not undertake to offer a complete solution of the silt problem. However, it is a very complete collection of available silt data from which some interesting and valuable conclusions are drawn.

In its studies the Division of Agricultural Engineering had the cooperation of the Department of Public Works of the State of California and the Imperial Irrigation District. Results of investigations by the Geological Survey and Bureau of Reclamation were also available. A brief synopsis of the "Summary and general conclusions" follows:

FEASIBLE CONTROL MEASURES

The economical remedial measures feasible of application to the control of Colorado River silt are (1) The storage of silt in a large reservoir located near the end of the canyon section, supplemented by storage of silt in smaller reservoirs located on tributaries; (2) the forming of settling basins and the installation of desilting structures at or near intakes of diversion canals; (3) the exercise of efficient control over the growth and maintenance of native grasses and other vegetable covering.

Owyhee Dam Design

(Continued from page 84)

tractor at 2,300 volts at rates to be stated in the contract.

SAND AND GRAVEL PITS

Excellent sand, gravel, and cobbles are available for the construction of the dam from natural deposits in the vicinity of Dunaway Siding, Oreg. The construction railroad connects with the Homedale branch of the Oregon Short Line Railroad at this point. The gravel pits are owned by the Government and no charge will be made to the contractor for the materials used in the construction of the dam. Preliminary tests indicate that practically all of the materials in the pit, with the possible exception of a small percentage of sand, can be utilized in the concrete and that the material will make durable concrete of high strength. Cobbles up to 8 inches in diameter will be utilized in the concrete.

nance of native grasses and other vegetable covering.

The specific gravity of silt transported by the Colorado River is normally 2.65, but the weight per unit varies within wide limits. After the river emerges from the canyon section and flows on flatter grades, the heavier silt is deposited as bed silt. The suspended silt transported into the lower basin of the Colorado River is fine in texture, and may be transported long distances if the mean velocity of the current exceeds two-thirds of a foot per second.

SILT CONTENT OF COLORADO

Although great quantities of silt are removed annually from the Imperial Valley canals by mechanical means, it is mainly bed silt, the quantity of suspended silt deposited being a small portion of the total quantity carried in suspension. The estimated average annual cost of silt disposal and control in Imperial Valley canals is about \$1,000,000. By properly designed settling basins, sluiceways, and desilting structures at the intakes of diversion canals it is possible to rid the water of half its suspended silt and most of the bed silt. Determinations of silt content of river water are usually made on a weight basis. "Percentage of silt by weight" is equivalent to the grams of dry silt contained in 100 grams of water and is derived by weighing the water, then the dry silt, and taking the proportion of the latter to the former. It is believed that the dry sediment in 1 cubic foot of suspended silt as carried by the Colorado River below Laguna Dam would weigh, on an average, about 62.5 pounds.

The dry weight per cubic foot of Colorado River sediment varies from 40 pounds for fine silt deposited in settling basins in Imperial Valley to 97 pounds for bed silt in Imperial Valley canals. The average weight of silt deposited in a large reservoir would depend on the thoroughness with which the fine silt was mixed with the coarse. If the two grades were deposited separately, the mean weight of dry silt contained in a cubic foot of moist sediment would approach 70 pounds, whereas if mixed the weight would be greater, but the average weight would not exceed 85 pounds. It is estimated that the normal quantity of silt annually transported to the lower end of the canyon section is 253,628,000 tons, or 137,000 acre-feet, on the basis of an average weight per cubic foot of 85 pounds. This figure is approximately 37 per cent higher than previous estimates have indicated.

Preventing silt from entering canal systems is a prime factor in the success of irrigation enterprises, but the means used to accomplish this purpose have been shown by experience to be temporary, unsatisfactory, or only partially effective.

BOULDER DAM WOULD IMPOUND SILT

The most feasible and economical means of solving the silt problem of Imperial Valley is to impound the river silt behind a high dam such as is proposed at Boulder Canyon. Partial resiltting of the river undoubtedly will occur for some time below such a dam, but the regulation of the flow will permit the water users to divert the surface waters only, and as the channel scours, the quantity of silt entering diversion channels will become negligible in time. In order that the capacity of a reservoir formed in Boulder Canyon may not be reduced by the deposition of silt more than two-thirds in 100 years of operation, it will be necessary to impound water to a depth of over 500 feet, if no other reservoirs are built above it. The construction of additional reservoirs and the increased use of water in the upper basin will tend to prolong the life of such a reservoir.

The authors consider that 137,000 acre-feet is a fair estimate of the average amount of silt which would be deposited annually in a reservoir located near the lower end of the canyon section of the river. On this basis, in 100 years the silt would occupy a space in the reservoir equivalent to 13,700,000 acre-feet. The proposed Boulder Canyon Dam if built to a height of 550 feet above mean low water in the river, would store approximately 26,000,000 acre-feet of water. In view of the fact that the quantity of silt transported is now believed to be considerably more than previous estimates have shown, earnest consideration should be given to raising rather than lowering the height of the proposed structure, for the principal reason that water can be stored in the upper levels of such a reservoir at a cost not exceeding 75 cents per acre-foot of storage.

The above are a few of the general conclusions made by Messrs. Fortier and Blancy. The bulletin contains a chapter on "Silt-sampling equipment" which describes the various types of samplers used. There are a large number of tables accompanying an interesting discussion of investigations in Imperial Valley, the Yuma irrigation project, and at other points in the lower Colorado River basin.

Enlargement of Minidoka Power Plant, Minidoka Project, Idaho

Growth of Minidoka Project Use of Electricity Requires Addition of a Sixth Power Unit

By H. H. Plumb, Engineer, Denver Office, Bureau of Reclamation

MINIDOKA power plant, located on Snake River at Minidoka Dam, was constructed in 1909. The original installation consisted of five main units and two exciter units, with a total capacity of 10,000 horsepower. At that time it was one of the largest power plants in Idaho. The plant was constructed primarily to supply cheap power for irrigation pumping to the lands on the South Side division of the Minidoka project in the vicinity of Burley, Idaho. Although the irrigation pumping plants have used the greater part of the electric power from this plant, there has been a surplus which has been sold at wholesale to the project towns and mutual electrical companies. The sale of this power has enhanced the prosperity of the whole project in several important ways. Profits accruing from the sale of power are credited to the water users through their districts. The project towns are also realizing profits in retailing electric light and power, which are being applied to the betterment of the communities, permitting early attainment of such things as front-rank public schools, pavements, and other civic improvements which could be had otherwise only by substantial increase of taxes. Not least among the benefits from the sale of surplus power is the benefit to the project farms and homes in making life more worth living on account of the labor-saving appliances and comforts that electricity provides.

By a happy coincidence, power for pumping irrigation water is needed only in the summer, whereas heat is required in the winter. This has made it possible to use the plant largely for irrigation from April to November, and largely for supplying electric heat to project homes, stores, offices, schools, etc., from October to May, when the power would otherwise go to waste. Electric lights and power are required throughout the year, of course. This combination has made possible a high percentage of utilization such as few other power plants enjoy.

Although this plant has now been operating practically 24 hours per day for some 19 years, it is by no means worn out. It has been a matter of pride with those entrusted with the care of the plant to keep every part of the equipment in the best of condition at all times, so that the best possible service might be rendered. Hence the plant is still good for many more years of service.

MORE POWER NEEDED

With the growth of the project, more commercial power has been required, and more pumped water has been needed. These demands outgrew the capacity of the Minidoka plant in 1921, and an exchange agreement was then made with the Boise project and the Idaho Power Co. whereby one-half of the capacity of the Boise Diversion power plant, amounting to about 800 kilowatts, was made available to the Minidoka project. During these years plans were being worked out for the construction and financing of the American Falls Dam with its power privileges, which were intended to provide a supplementary supply of power needed on the Minidoka project. The power shortage became so acute in 1924, in spite of the additional power secured from the two small plants at American Falls, which were acquired from the Idaho Power Co., that the installation of a sixth unit at Minidoka power plant was authorized.

The sixth unit was placed in the space occupied by the two turbine-driven exciters and the largest turbine that could be installed in the available space was 3,500-horsepower capacity. The old exciters were replaced with two new motor-driven exciters which were installed in a suitable location where they would not interfere with the new construction work. The new exciters have a direct current capacity of 1,080 amperes each at 125 volts and the five original generators can be supplied by one of these exciters, leaving the other as a spare. Each exciter is direct connected to a 200-horsepower motor, 1,200 speed, 2,300 volt, both motor and generator being mounted on a common cast iron plate. Remote control is provided so that the operator may start either unit by pressing a button on the switchboard.

In order to be able to start up the plant after a complete shut down, the storage battery required for operation of the oil circuit breakers was provided with sufficient capacity to excite one generator long enough for starting purposes. Provision was made for charging this battery with Tungsar rectifiers, which were chosen in preference to the customary motor-generator set because the rectifiers have no moving parts and replacement of bulbs is more quickly and cheaply done than overhauling rotating machinery.

INSTALLATION OF NEW UNIT

After the new motor-exciter sets and new station-service bus were placed in operation, the work of removing the old exciters was started in order to make room for the sixth unit. A cofferdam, to permit removal of the exciter penstock gates and installation of the new 11 by 11 foot penstock gate, was placed over the entrance to the penstock during the autumn low reservoir period. Behind this cofferdam the old exciter gates were removed and the new penstock gate and frame were installed, after which the cofferdam was removed and the lake level brought back to normal.

The new penstock to conduct the water from the reservoir to the turbine is 10 feet in diameter at the large end, tapering to the scroll case of the turbine, and is made of one-half inch plate steel. The penstock is partly embedded in concrete, and the turbine scroll case entirely embedded.

The 3,500-horsepower turbine operates at a speed of 200 revolutions per minute with a power head of 47 feet of water, and is 90 per cent efficient at full load. The speed is held constant within two revolutions per minute by a sensitive governor with motor-driven flyballs, and the heavy turbine gates are opened or closed as necessary by the governor acting through sensitive but powerful relays using oil under high pressure, as the source of power, obtained by pumping oil into a pressure tank. The power water after passing through the turbine is discharged through a draft tube formed in the concrete.

The generator is direct connected to the vertical turbine shaft with rigid flange coupling. The generator contains a liberal thrust bearing to support the weight of the rotating parts of the generator, turbine, and exciter. This unit has its own exciter mounted above the generator and direct coupled to the vertical shaft, with capacity to excite this generator only. The generator has a capacity of 2,400 kilowatts, or 3,200 electrical horsepower at 2,300 volts, 3 phase and 60 cycles with full load efficiency of 95 per cent, and operates as a unit with its bank of transformers.

Power for the station oil pumps, blowers, main exciter motors, and other auxiliaries is supplied from a station service bus which may be connected to either

unit No. 1 or No. 6 through automatic oil circuit breakers. Power is distributed from the station service bus to the 2,300-volt motors, and to the low voltage motors through a bank of three 50-kilowatt transformers which transform the voltage from 2,300 volts to 115 and 230 volts.

SAFETY MEASURES

On account of insufficient room for additional high-voltage apparatus inside the station, and in order to reduce the fire hazard, it was found advisable to place the new transformers and high-voltage equipment out of doors. A steel switching tower was provided, with one section for each oil-circuit breaker, and provision made for extending the tower by adding new sections as required. The tower was located near the power plant on a point of land projecting out into the reservoir. It was necessary to fill in the ground to some extent to provide a level foundation for the tower and apparatus. The tower contains one 33,000-volt oil-circuit breaker for each of the three outgoing transmission lines, one oil-circuit breaker to connect unit 6 to the 33,000-volt busbars, and one spare oil-circuit breaker which may be substituted for any of the other breakers when necessary to take them out of service for repairs or maintenance. These breakers are the safety valves to relieve dangerous conditions brought about by lightning or other causes, and are provided with ample capacity to interrupt the heavy current due to short-circuit conditions.

Lightning arresters are provided for each line, whose purpose is to protect the transformers, generators, and other electrical equipment from excessive voltage caused by lightning or switching surges.

The single-phase transformers for unit 6 have a capacity of 800 kilowatts each or 1,100 electrical horsepower, a total of 3,300 horsepower for the three required for this unit. A fourth is provided as a spare to replace any transformer becoming damaged in service. These transformers are used to raise the generator voltage from 2,300 volts to 33,000 volts, the higher voltage being needed to transmit power for long distances without excessive loss. The transformer efficiency is almost 99 per cent. The transformers are provided with electric thermometers which will ring an alarm in case they get too warm for safety. The power is brought from the generator to the transformers through underground cables. Tracks, transfer car, and derrick are provided for moving the transformers from the outdoor station into the power house when necessary for maintenance or repairs.

THE SWITCHBOARD

The switchboard for controlling the new unit has several points of interest. It

Reclamation Bureau Dams Estimated vs. Actual Cost

THE accompanying list shows a comparison of the estimated and actual costs of the principal dams constructed by the Bureau of Reclamation. It will be noted that on some of these the actual cost has exceeded the estimates, but the dams for which this is true are in all cases those which were constructed in the early years of the bureau's existence. The first 10 years of construction activities by the bureau were years of rapidly rising costs in all lines, and construction work executed in many cases several years after the preparation of the estimates naturally showed higher unit costs than were stated in the preliminary figures.

During the past five years the Bureau of Reclamation has made a number of contracts for the construction of irrigation works in which total sums were named to cover the work included in the respective contracts, and in every case the contemplated works have been completed within the figure stated in the contract. Owing to the uncertainties involved on account of unexpected foundation conditions, unanticipated flood heights, and many other risks, estimating the costs of dam construction is naturally one of the most diffi-

cult features of the engineering work of the bureau; and the enviable record achieved on the more recent dams, as shown in the table, is one of which any engineering organization might well be proud.

contains a voltage regulator, which automatically keeps the generator voltage steady and at the proper value, this being done without any attention from the operators. An ingenious system of relays is provided, one of which instantly disconnects the generator in case an electrical fire should start in the generator windings. A similar relay protects the transformer bank. Other relays ring an alarm bell in case of overload on the unit. The switchboard panel for the new unit provides for remote control of various operations such as opening or closing the 11 by 11 foot penstock gate. This gate opens by an electric motor which starts at the touch of a button and stops itself when fully open, and closes in the same manner. The oil-circuit breakers are closed by powerful electric magnets at the turn of a button, but are tripped out automatically by relays when trouble occurs out on the line.

It will be readily seen that many of the devices described above have as their object the minimizing or elimination of interruptions to service. These are provided in order to raise the standard of electric service to the project users of water and electricity, both of which are dependent upon a reliable power plant at Minidoka Dam.

cult features of the engineering work of the bureau; and the enviable record achieved on the more recent dams, as shown in the table, is one of which any engineering organization might well be proud.

Principal dams constructed or under contract by the Bureau of Reclamation

Name	Project	Estimated cost	Actual cost
American Falls ¹	Minidoka	\$3,500,000	\$7,300,000
Arrowrock ¹	Boise	6,250,000	4,496,731
Avalon	Carlsbad	162,000	315,989
Belle Fourche	Belle Fourche	1,040,416	1,259,515
Black Canyon	Boise	1,800,000	1,492,305
East Park	Orland	198,000	196,120
Echo	Salt Lake Basin	1,394,590	1,125,098
Elephant Butte ¹	Rio Grande	5,600,000	5,004,216
Gibson	Sun River	1,826,129	1,566,240
Guernsey	North Platte	1,780,000	1,700,351
Kachess	Yakima	712,000	661,000
Keechelus	do	1,069,000	1,892,778
Laguna	Yuma	972,455	1,980,462
McKay	Umatilla	2,500,000	2,116,828
Pathfinder ¹	North Platte	1,000,000	1,794,366
Roosevelt	Salt River	13,750,000	13,806,277
Sboshone	Sboshone	13,000,000	1,439,135
Stony Gorge	Orland	609,524	518,904
Tieton ¹	Yakima	4,020,000	3,756,256
		44,184,180	42,422,571

¹ Dam and reservoir.

² Increase due to use of concrete core wall instead of sheet piling, two new tunnels to increase spillway capacity, and an additional spillway of reinforced concrete. These changes cost over \$100,000.

³ Failure of contractors delayed work two years, and this, together with additional construction of a gravel berm and installation of auxiliary valves, increased the estimated cost.

⁴ Engineer's estimate of cost of principal construction. Does not include gates, cement, or other accessories and materials furnished by the United States.

⁵ Contractor's bid.

⁶ Modified by board report of Dec. 16, 1913, to \$1,337,000.

⁷ Difficulty of obtaining suitable material increased cost by \$240,000. Other changes which greatly increased the original estimate were riprapping, inclusion of concrete cut-off wall, changes in tunnel scheme, increased excavation for spillway and beaver concrete lining, additional road construction and clearing and logging reservoir—the latter item alone costing \$290,000.

⁸ The surface of the dam was paved with concrete instead of rock as originally intended, due to poor quality of rock obtainable. Notwithstanding predictions of geologists, the rock uncovered in the quarries was found unsuitable for such paving, and its use had to be abandoned in favor of concrete. Sluiceways were also paved with concrete for the same reason. There was considerable waste in quarrying, at times 50 per cent, due to poor quality of rock, thereby greatly increasing excavation quantities. Use of sheet piling had to be considerably increased. The river break into Salton Sea increased transportation difficulties by rendering the river unnavigable. There was a large increase in cost due to increase in price of labor and materials.

⁹ No detailed estimate found, but early board reports show \$1,000,000 allowed for Pathfinder Reservoir.

¹⁰ Increase partly due to the building of an additional outlet tunnel, and changes made in north tunnel, both together amounting to \$641,000.

¹¹ 190-foot dam.

¹² 220-foot dam.

¹³ No detailed estimate found, but early correspondence gives \$1,000,000 as the preliminary estimate.

AT Gibson Dam, Sun River project, 13,260 cubic yards of concrete were placed in the dam during the month, bringing the total to 26,000 cubic yards. The river has been diverted from the flume through the diversion openings of the dam.



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor, New Reclamation Era



Convenient Kitchens in Rural Districts



Utilizing waste space

A THOUSAND or more meals are prepared in the average family kitchen each year. Three hundred and sixty-five breakfasts, dinners, and suppers entail a lot of planning and work, and much thought and effort along the line of shortening the housewife's time in the kitchen should be given as it affects so many.

Washing and ironing and lots of other work not directly connected with the preparation of food are often crowded in the home kitchen. The ideal arrangement is to except these.

The small oblong kitchen is recommended over the big square kitchen of earlier days and in planning a new home this can be considered, but many times it is up to the housewife to make the best of what she has.

Utilizing Waste Space

The corner between the stove and the wall is almost never utilized. In most kitchens it is too small and awkward to



Improved farm kitchen

get at, so nothing is kept there. This waste space in the picture was made even more hopeless because an old, unused staircase ran up to the second floor just there. The stovepipe was run through this staircase, the wood lined with metal to make it fireproof, and the space under the tread was made into a closet for pots and pans, mop, soap shaker, and other accessories to dishwashing. A home-made sink was installed, taking advantage of the good light from the window. There was another space available above the pot cupboard and as the heat from the stovepipe is just right for a warming closet, the housewife raises her bread there.

She also made herself a wheel-tray from an old washtand, and a high stool, and took all the old paint off her kitchen cabinet, enameled it white, and painted a number of coffee cans for cereals and supplies, thus making her kitchen very compact and convenient.

Improved Farm Kitchen

Here's a New Jersey farm kitchen which has all the conveniences of a city home and some of the advantages of a country house, too. The very modern porcelain sink has been properly placed at a height from the floor convenient for the woman who is likely to do most of the work at it. The sink has a drain board of its own and there is a little extra shelf at the side for better handling of the dishes as they are washed. Soiled dishes are brought from the table on the tea wagon, which was made by the woman and her husband. A high stool, which is on casters, like the tea wagon, enables the housewife to sit down while washing dishes if she wishes to. Under the handy shelf above the sink all the small miscellaneous utensils in constant use are hung as soon as they are washed. A drain basket is used to eliminate some of the wiping with a towel, since dishes may be placed in the basket and drenched with scalding hot water, then left to dry.

Kitchen Lighting

Every kitchen needs good artificial lighting as well as plenty of daylight and sun during some part of the day.

Good lighting arrangement for the farm kitchen would seem to involve four fundamental principles:



Kitchen lighting

1. Adequate lighting.
2. Absence of glare.
3. Good distribution of light.
4. Pleasing appearance.

Dark, gloomy kitchens may often be transformed into cheerful workrooms by cutting an additional window or by painting walls, woodwork, and equipment a color that reflects rather than absorbs light.

The kitchen shown above is in a purely rural section. It is in charge of a real housekeeper.

A Double Decker Table

A housekeeper living in Wythe County, Va., had a small table which she liked to use in her kitchen, but she found that it was much too low for comfort in working. She made it higher by adding an upper deck about 10 inches above the original top. This was finished with linoleum, so that it could be used in conjunction with her dish drainer, next to the sink. Casters were put on the table, also hooks for small brushes used around the sink, and a large white enamel piteher needed to scald her freshly washed china. There was space



A double-decker table

in the lower "deck" for the dishpan and dish drainer when not in use. The bottom of an old roasting pan was fitted with handles and used as a tray. With this equipment the housewife could dispense with wiping her dishes entirely, except for silver and glass. A set of convenient drawers built under the drainboard on the other side of the sink served as a place in which to keep clean towels and aprons.

Budgets and Household Accounts

The woman in the home partnership often handles the greater part of the family money. For the same reasons that business accounting is considered important, family expenditures should be recorded. After all, there is a certain satisfaction in seeing what can be accomplished with the means at one's disposal.

The various groups of home expenses—food, housing, clothing, etc.—may be compared to the different divisions of a business enterprise. Without a satisfactory system of records there would be no

way for the business man to know which departments were well managed and which needed improvement.

On a comparable basis any group of household expenses must stay within the budget for that group. It is not enough, therefore, merely to list home expenditures in miscellaneous order, they must be classified under different heads so they may be analyzed and used as a guide to future spending.

If household accounts are set up this year and division of expenses is made, experience will teach a better way to set them up next year and, with this year's accounts as a nucleus, it won't be long before the housewife will have worked out household accounts peculiarly fitted to her needs. There will be no uncertainty but facts black on white to form the basis of improvement.

Reclamation Reservoirs Stocked With Food Fish

Many storage reservoirs of the Bureau of Reclamation are becoming so well

stocked with choice fish as to be very inviting to the sportsman. During the past 10 years the records show that more than a million and a half fish have been placed in 12 reservoirs.

The fish selected for stocking these artificial lakes of the Government are of the choicest varieties. For the warmer waters of the reservoirs in the Southwestern States black bass, large-mouth bass, rock bass, crappie, sunfish, catfish, buffalo fish, and yellow perch have been supplied in large numbers. The species furnished for the more northerly reservoirs have been largely the eastern brook trout, black-spotted trout, rainbow trout, and lake trout.

The fish are delivered by means of the Bureau of Fisheries cars at the railroad stations nearest the waters for which they are intended and thence transported to the reservoirs by motor truck or other conveyance by representatives of the Bureau of Reclamation. Thus, selected fish from far away waters come into the West where they multiply under favorable conditions and promise sport and food to a developing people.



INTERNATIONAL WATER COMMISSION

UNITED STATES AND MEXICO

This photograph was taken at the first joint meeting of the American and Mexican sections of the Commission at El Paso, Tex., February 23, 1928.

Seated, left to right: Gustavo P. Serrano, chairman, Mexican section; Miss Mae A. Schnurr, secretary, American section; Dr. Elwood Mead, chairman, American section.

Standing, left to right: Gen. Lansing H. Beach, American section; Amando Santa Cruz, Mexican section (acting for Frederico Ramos, absent); J. Sanchez Mejorado, Mexican section; W. E. Anderson, American section; Fernandez MacGregor, secretary, Mexican section.

The Iron Canyon Project, California

Summary of a Report of Investigations by Walker R. Young, Engineer, Bureau of Reclamation

A REPORT of investigations of the Iron Canyon project by Walker R. Young, engineer, Bureau of Reclamation, with map, plans, and cost, has been printed in Bulletin No. 13, entitled, "Development of the Upper Sacramento River," by the division of engineering and irrigation of the Department of Public Works of the State of California. These investigations were undertaken under a cooperative agreement dated January 26, 1924, between the United States, the State of California, and the Sacramento Valley Development Association. The following is a summary of the data presented in the report:

GENERAL

The Iron Canyon project has an estimated area of about 277,000 acres and is located in the upper Sacramento valley extending from Red Bluff Creek to point of diversion on the north to the Colusa-Yolo County line on the south, a distance of over 100 miles. All but about 7,000 acres are located on the west side of the river.

The water supply is to be obtained from the storage of surplus flood waters in a reservoir having a capacity of more than 1,000,000 acre-feet, about 4 miles above Red Bluff, formed by the construction of a concrete gravity dam in Iron Canyon. Power to the estimated amount of 110,000 horsepower can be developed at this dam. About 10,000 horsepower can also be developed 5 miles below the diversion dam. The gross cost of the project is estimated at about \$56,000,000, or more than \$200 per acre.

WATER SUPPLY

The Sacramento River has an average annual flow above Iron Canyon dam site of about 10,000,000 acre-feet. The minimum flow of record is about 3,000,000 acre-feet for the year 1923-24, or about 30 per cent of normal. Prior water rights will require about 1,677,000 acre-feet. The shortage for 1923-24 is the only one that has occurred in a period of 29 years. Storage in the reservoir will be provided for 1,121,900 acre-feet, and allowing for seepage, evaporation, and some natural inflow, an estimated net amount of 800,000 acre-feet of water will be available through storage.

POWER DEVELOPMENT

About 110,000 horsepower can be developed at the Iron Canyon Reservoir. The

head will range from 115 feet to a maximum of 152.5 feet, and the average annual output is estimated to be about 600,000,000 kilowatt-hours. Another power plant is planned to be located about 5 miles below the diversion dam at Mooney Island, at which it will be possible to develop about 60,000,000 kilowatt-hours. The average annual possible revenue from power is estimated at nearly \$2,000,000.

ENGINEERING FEATURES

Storage is by a concrete gravity section dam with an upstream face vertical and 1:1 downstream face. Height, 180 feet; length, 5,175 feet; location, about 3 miles above Red Bluff. A gap in the rim of the reservoir will be closed by an embankment 67 feet high with a concrete core wall.

The diversion works are to be located in the Sacramento River, about 3 miles below Red Bluff, and consist of a concrete weir 832 feet long with 12 openings in which are installed roller gates. A sluiceway is located at one end of the dam and a fishway at the other end.

Pathfinder Reservoir Again A Bird Reserve

President Coolidge has issued an executive order reestablishing the Pathfinder Reservation in Wyoming, for use as a preserve and breeding place for native birds.

This reservation includes primarily the Pathfinder Reservoir, the lake impounded by the Pathfinder Dam, and its immediate surroundings. This area was once before designated as a bird sanctuary and existed as such from 1909 to 1922. Its value was chiefly as a breeding place for water fowl. These birds in their migrations then seemed to change their habits and stop less at this lake than formerly. It was thought wise to release the restrictions with relation to it. Of late, however, the migrating water fowl have returned and the Secretary of Agriculture has recommended its reestablishment as a bird reserve.

Thus in this area it becomes again unlawful "to hunt, trap, capture, wilfully disturb or kill any wild animal, or bird of any kind whatever, or take or destroy the eggs of any wild bird except under such rules and regulations as may be prescribed by the Secretary of Agriculture."

The west side low-line canal begins at the diversion dam and extends for over 120 miles down the river. It includes 29 siphons and 10 wasteways, and at a point 4.7 miles below the intake there will be located the Mooney Island power plant.

The west side high-line canal begins at the diversion dam and will furnish water for irrigating about 40,000 acres of land with a maximum lift of 50 feet. The capacity of the canal is 370 second-feet.

The east side canal diverts from the Iron Canyon Reservoir and will irrigate about 7,000 acres. Maximum capacity is 90 second-feet.

COST BY FEATURES

Item	Gross cost
Iron Canyon Reservoir and power plant..	\$24,772,500
Diversion dam.....	1,410,000
Main canal to Mooney Island.....	938,055
Mooney Island power plant.....	928,000
Main canal below Mooney Island, exclusive of lining.....	5,798,255
Main canal lining.....	7,853,545
Red Bank pump canal.....	1,088,132
Red Bank pump plants.....	452,079
Remainder of pump plants.....	496,776
Carriage for pump areas near Orland project.....	348,000
7,000-acre east-side unit.....	134,000
Project administration buildings.....	83,500
Distribution system.....	7,891,650
Drainage system.....	3,945,825

Total, construction items..... 56,140,317

CROPS

A wide diversity of crops, including alfalfa, barley, oats, wheat, rice, melons, garden truck, citrus fruits, nuts, olives, pears, plums, and grapes, can be grown on the project. The growing season is from March to October. Experiments have been made on cotton with satisfactory results, and it is believed that it may become an important crop on this project.

TRANSPORTATION AND SETTLEMENT

The main line of the Southern Pacific Railroad runs through the project, and no lands are more than 5 miles from the main or branch line of the railroad. There is a well-developed system of highways, including a paved road from San Francisco, Calif., to Portland, Oreg., which runs through the length of the project. Markets are favorably located, and the principal towns are Corning, Willows, Arbuckle, Red Bluff, Orland, Maxwell, Colusa, and Williams.

RECOMMENDATION

The report concludes with the following recommendation:

"If a large project in Sacramento Valley is considered feasible and desirable, it is recommended that further investigations be made of other areas which might be served by Iron Canyon Reservoir in order that a judicial selection of the area to be included within the project may be made. Several projects which may have merit are described in the report."

Legal Notes Relating to the Reclamation Projects

State Taxation of Land Which the United States Has Contracted to Sell

IN *City of New Brunswick v. United States*, decided April 9, 1928, the Federal Supreme Court considered the power of a State to tax real property sold by the United States, acting by the United States Housing Corporation, the purchase price being payable in installments over a period of years. The purchaser had made the payments (10 per cent of the purchase price) entitling him under his contract with the United States to call for a deed, with mortgage back to secure the payment of unpaid installments. No such deed, however, had been issued. The city of New Brunswick, under the authority of the laws of New Jersey, where the land was situated, levied taxes upon the land after the purchaser had so become entitled to a deed. The United States brought a suit to have the tax assessments canceled and the tax sales enjoined.

The Supreme Court in holding against the United States says:

"We see no reason * * * if the New Jersey law permits, why the city may not assess taxes against the purchasers upon the entire value of the lots and enforce collection thereof by sale of their interests in the property. With that the corporation and the United States have no concern. But it is plain * * * that the city is without authority to enforce the collection of the taxes thus assessed against the purchasers by a sale of the interest in the lots which was retained and held by the corporation as security for the payment of the unpaid purchase money, whether as an incident to the retention of the legal title or as a reserved lien or as a contract right to mortgages. That interest, being held by the corporation for the benefit of

the United States, is paramount to the taxing power of the State and can not be subjected by the city to sale for taxes.

"We conclude that, although the city should not be enjoined from collecting the taxes assessed to the purchasers by sales of their interests in the lots, as equitable owners, it should be enjoined from selling the lots for the collection of such taxes unless all rights, liens, and interests in the lots, retained and held by the corporation as security for the unpaid purchase moneys, are expressly excluded from such sales, and they are made, by express terms, subject to all such prior rights, liens, and interests. This, we think, will meet the equities of the case as between the corporation and the city, and fully protect the paramount right of the United States."

Contract Between the United States and the North Side Canal Co., Gravity Extension Division, Minidoka Project

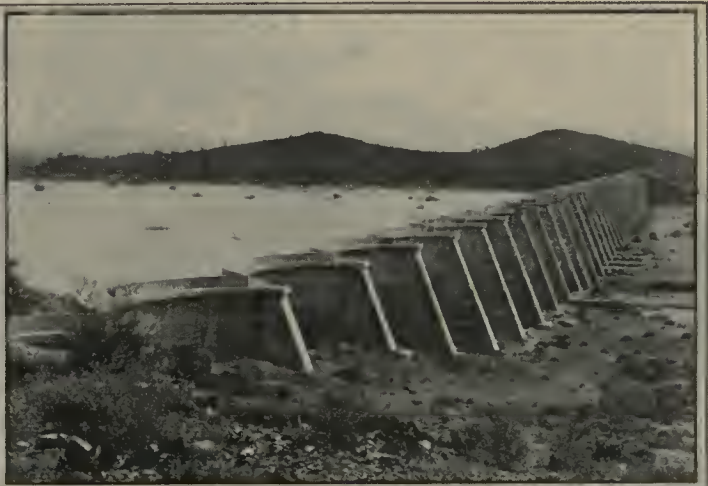
The North Side Canal Co. diverts water from the Snake River for the irrigation of a large area in southeastern Idaho. The upper end of the company's diversion canal is too small and has been difficult to operate. The gravity extension division of the Minidoka project, recently authorized by Congress, will divert water from the Snake River a short distance above the company's canal, and the Secretary of the Interior has recently approved a form of contract by which the first few miles of the Govern-

ment canal will be built of sufficient capacity to carry water for both projects. By means of such cooperation the cost per cubic yard of material moved will be reduced.

The company is to advance its proportionate part of the cost of the work, which is to be carried out under the act of March 4, 1921 (41 Stat., 1404), reading in part as follows: "All moneys hereafter received from any State, municipality, corporation, association, firm, district, or individual for investigations, surveys,

construction work, or any other development work incident thereto involving operations similar to those provided for by the reclamation law shall be covered into the reclamation fund and shall be available for expenditure for the purposes for which contributed in like manner as if said sums had been specifically appropriated for said purposes."

Many of the irrigation manager's troubles can be avoided if he is able to give general satisfaction in distributing water.



Cave Creek Dam, Salt River project, Ariz. Upper and lower faces

Legislation Affecting the Projects Taxing Reclamation Entrymen's Land

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the lands of any homestead entryman under the act of June 17, 1902, known as the reclamation act, or any act amendatory thereof or supplementary thereto, may, after satisfactory proof of residence, improvement, and cultivation, and acceptance of such proof by the General Land Office, be taxed by the State or political subdivision thereof in which such lands are located, in the same manner and to the same extent as lands of a like character held under private ownership may be taxed.

SEC. 2. That the lands of any desert-land entryman located within an irrigation project constructed under the reclamation act and obtaining a water supply from such project and for whose land water has been actually available for a period of four years, may likewise be taxed by the State or political subdivision thereof in which such lands are located.

SEC. 3. That all such taxes legally assessed shall be a lien upon the lands and may be enforced upon said lands by the sale thereof in the same manner and under the same proceeding whereby said taxes are enforced against lands held under private ownership: *Provided*, That the title or interest which the State or political subdivision thereof may convey by tax sale, tax deed, or as a result of any tax proceeding shall be subject to a prior lien reserved to the United States for all the unpaid charges authorized by the said Act of June 17, 1902, whether accrued

or otherwise, but the holder of such tax deed or tax title resulting from such tax shall be entitled to all the rights and privileges in the land of an assignee under the provisions of the act of June 23, 1910 (Thirty-sixth Statutes, page 592).

Approved, April 21, 1928.

Device for Removing Accumulated Silt

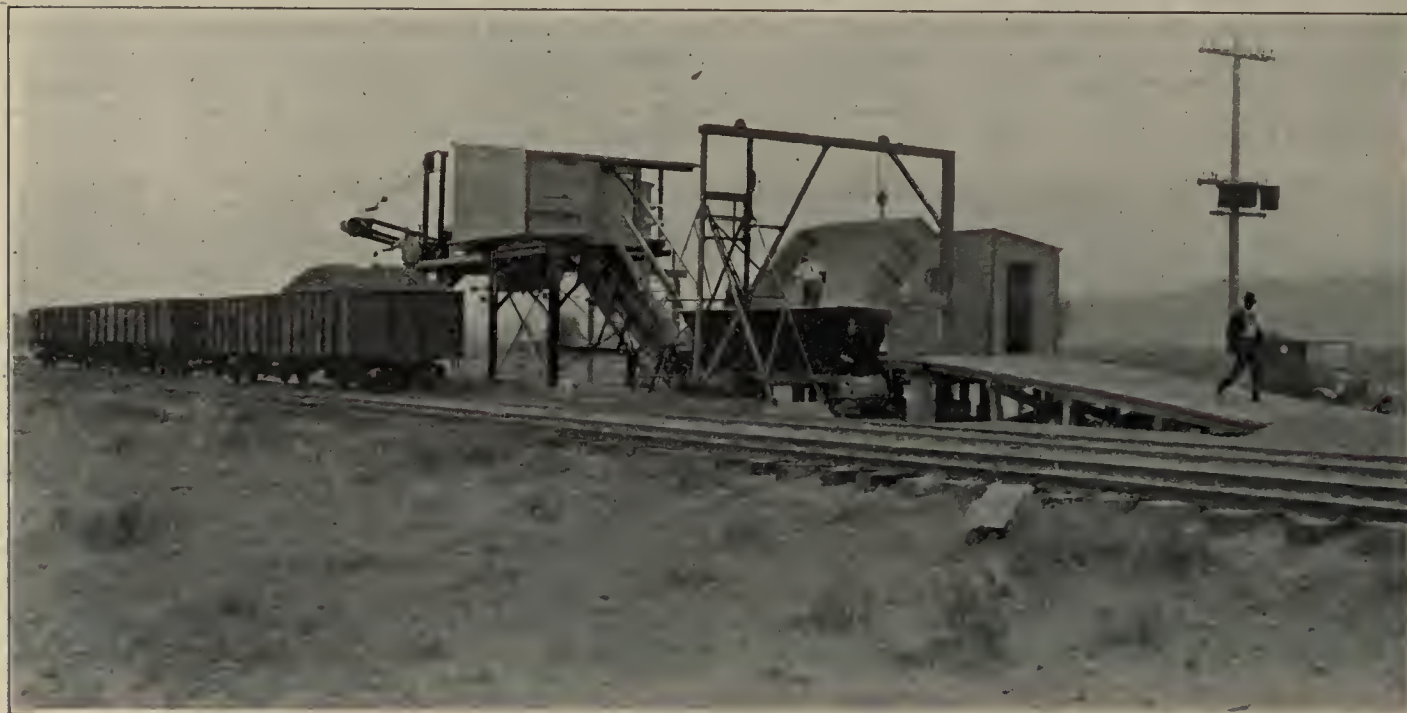
A device for removing accumulated silt in the B-12 pipe line, Yuma Mesa division of the Yuma project, Arizona, has been built in the project shops and has proven successful in removing the silt obstructions in the pipe lines. It is constructed of a 50-gallon metal oil drum 24 inches in diameter with an air chamber around the drum on the inside of sufficient size to give it the desired buoyancy. An opening is left through the center of the drum 18 inches in diameter in which are long blades running the length of the drum attached to a shaft which allows them to revolve as water passes through. This device is let through the pipe line with a rope to prevent too rapid motion. It cleans an average of 150 feet of 33-inch pipe a day with practically no expense of operation.

Potatoes Brought This Farmer \$70,000 Profit

Mark Woodruff, secretary of the Columbia Basin Irrigation League, vouches for this story. He writes that while in Seattle recently he received a call from a farmer on the Twin Falls project, Idaho, who had sold his place a short time before and moved over on the west side. He told Mr. Woodruff that he had purchased two business blocks in Seattle at a price that totaled approximately a quarter of a million dollars. Curious to know how a retired farmer could have accumulated that much money, Mr. Woodruff asked him about it and was told of the great success he had had in growing potatoes on his Idaho farm since 1906, his banner year being 1926, with a net profit that year of over \$70,000. Here are the ex-farmer's figures as given to Mr. Woodruff:

"I had 120 acres and raised 200 sacks per acre, making 24,000 sacks, each weighing 110 pounds, or a total of 2,640,000 pounds. The price these potatoes sold for was \$3.15 per hundred pounds, making the total amount received \$83,160. At 350 sacks to the car, there would be a little over 68 carloads."

THREE applicants for farm units on the Willwood division of the Shoshone project were found qualified by the board of examiners and made homestead entry, bringing the total of new settlers on this division to 28.



Electrically-operated beet dump, Minidoka project, Idaho

Formulae For Estimating The Flow Of Water In Pipes

INQUIRIES are received from time to time as to the formulæ used by Bureau of Reclamation engineers for estimating the flow of water in pipe lines of various materials. The following paragraphs give this information in condensed form. For more complete information as to the derivation of the formulæ, and the data upon which they are based reference is made to the various bulletins cited and to standard works on hydraulics.

Let Q =discharge in cubic feet per second.

D =diameter of pipe in feet.

d =diameter of pipe in inches.

H =friction slope in feet per 1,000 feet.

WOOD STAVE PIPE

$$Q=1.21 D^{2.65} H^{0.555}$$

This is Seobey's formula modified by a safety factor of 5 per cent, as recommended on page 66, Bulletin 376, United States Department of Agriculture.

CAST IRON PIPE

$$Q=1.31 D^{2.7} H^{0.555}$$

This is the formula given in Bulletin 376 referred to above. The Bureau of Reclamation has had very little occasion to calculate the flow of water in cast-iron pipe.

PRECAST CONCRETE PIPE

For pipe 12 inches to 21 inches in diameter:

$$Q=0.00179d^{2.625} H^{0.5}$$

For pipe larger than 21-inch diameter:

$$Q=0.00192d^{2.625} H^{0.5}$$

These are Seobey's formulæ modified by a factor of safety of 5 per cent as suggested on page 54 of Bulletin No. 852 of the United States Department of Agriculture, the values of Seobey's coefficient C , used being 0.345 for 12-inch to 21-inch diameter pipe and 0.370 for pipe

larger than 21-inch diameter. Owing to the inability of working inside of the smaller group of pipe the finished joints between pipe units are rougher than for the larger group.

MONOLITHIC CONCRETE PIPE

For monolithic concrete pipe cast in place, the Chezy formula is used, with Kutter's $n=0.014$.

RIVETED STEEL PIPE

This bureau now has no single formula for universal use in calculating the flow of water in riveted steel pipe. For the smaller sizes of pipe, where plate thicknesses and rivet heads are not large, the Hazen-Williams formula is used. This formula is $V=Cr^{0.63} S^{0.54} 0.001^{-0.04}$. The value of C is usually taken as 100, r is the hydraulic radius and S is the slope. For the larger sizes of pipe the Chezy formula is used. The value of Kutter's n used varies from 0.014 for the smoothest condition of inside surface up as judgment dictates.

DRAIN TILE

For drain tile, the practice has been to use the Chezy formula with Kutter's $n=0.015$.

World Population, Area, and Irrigated Acreage

For every 1,000 people in North America there are 168 acres of irrigated land. In the United States there are 172 acres of irrigated land to every 1,000 people. This is more irrigated land in proportion to population in North America than exists on any other continent. Oceania ranks second with 140 acres to every 1,000 people, and Asia third with 88 acres per 1,000.

This information is given out by the Department of the Interior through its Bureau of Reclamation, and is based on data compiled by the International Institute of Agriculture.

For figures based on the number of irrigated acres for each 100 square miles North America does not make so good a showing. In proportion to its area there

is more irrigated land in Asia than any other continent. The average is 562 acres to each 100 square miles. Europe has 323 irrigated acres to each 100 square miles while North America has but 305. The United States considered without the rest of North America, however, has 666 irrigated acres to each 100 square miles which surpasses the Asiatic area record.

WORLD POPULATION, AREA, AND IRRIGATED ACREAGE

Continent	Population ¹			Area ¹			Irrigated area			Population per square mile		Irrigated acreage per 100 square miles		Irrigated acreage per 1,000 population	
	Number	Per cent of total	Rank	Amount	Per cent of total	Rank	Amount	Per cent of total	Rank	Number	Rank	Amount	Rank	Amount	Rank
				<i>Sq. miles</i>			<i>Acres</i>								
North America.....	157,450,500	8.3	3	8,685,833	17.2	3	26,538,000	18.2	2	18.1	3	305	3	168	1
South America.....	69,749,600	3.7	5	7,169,587	14.2	4	4,213,000	2.9	5	9.7	5	59	5	60	5
Europe.....	477,560,200	25.2	2	3,723,081	7.4	5	12,041,000	8.3	3	128.2	1	323	2	25	6
Asia.....	1,037,854,700	54.8	1	16,217,166	32.0	1	91,196,000	62.5	1	63.9	2	562	1	88	3
Africa.....	143,335,400	7.5	4	11,514,050	22.7	2	10,460,000	7.2	4	12.4	4	90	4	73	4
Oceania.....	9,029,300	.5	6	3,307,940	6.5	6	1,270,000	.9	6	2.7	6	38	6	140	2
Total.....	1,894,979,700	100.0		50,617,657	100.0		145,718,000	100.0		37.4		288		77	
United States.....	117,135,800			3,026,805			20,175,000			38.7		666		172	

¹ Data from Statistical Yearbook, International Institute of Agriculture, 1926-27, and do not include the polar regions which have an area of more than 5,000,000 square miles.

Cotton Grown on the Projects in 1927

Cotton was grown on five Federal irrigation projects during 1927. The area devoted to this crop on the Salt River project, Arizona; the Yuma project, Arizona-California; the Orland project, California; the Carlsbad project, New Mexico; and the Rio Grande project, New Mexico-Texas, amounted to 178,875 acres, which in 1927 produced 140,280 500-pound bales of lint and 62,640 tons of seed, having a total value of \$16,705,727, or \$93.40 per acre.

The largest acreage, yield, value, and value per acre were found on the Rio

Cotton grown on reclamation projects, 1927

Projects	Area	Total yield		Average per acre		Value	
		Lint	Seed	Lint	Seed	Total	Per acre
	<i>Acres</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>		
Salt River.....	61,218	20,886,300	41,772,600	341.18	682.36	\$5,266,418	\$86.02
Yuma.....	22,224	7,876,825	14,429,940	354.42	649.28	1,834,385	82.54
Orland.....	76	23,000	42,000	302.63	552.63	5,060	66.58
Carlsbad.....	16,442	6,867,195	11,278,360	417.66	685.95	1,589,639	96.69
Rio Grande.....	78,915	34,487,150	57,769,680	470.00	732.04	8,010,225	101.50
Total and average.....	178,875	70,140,470	125,292,580	392.12	700.45	16,705,727	93.40

Grande project, New Mexico-Texas, where the 78,915 acres devoted to this crop produced 68,974 500-pound bales of lint and 28,885 tons of seed, valued at \$8,010,225, or \$101.50 per acre. The value of the

crop on the 61,218 acres on the Salt River project amounted to \$5,266,418 or \$86.02 an acre.

The detailed statistics are given in the accompanying table.

Apples Grown on Projects in 1927

Apples were grown on 12 Federal irrigation projects in 1927. The 23,907 acres in apple orchards produced in that year a total yield of 205,165,000 pounds of apples valued at \$5,293,000, or \$221.40 per acre.

The largest acreage, yield, and total value were found on the Yakima project, Washington, where 15,451 acres produced 148,359,580 pounds of apples valued at \$3,803,402, or \$246.16 per acre. The Okanogan project, in the same State,

Apples grown on reclamation projects, 1927

Project	Area	Yield		Value	
		Total	Average per acre	Total	Per acre
	<i>Acres</i>	<i>Pounds</i>	<i>Pounds</i>		
Orland, Calif.....	6	9,000	1,500	\$300	\$50.00
Uncompahgre, Colo.....	1,333	4,620,375	3,466	62,809	47.12
Boise, Idaho.....	2,249	13,652,560	6,070	332,270	148.00
King Hill, Idaho.....	288	1,096,427	3,770	24,445	84.50
Minidoka, Idaho.....	68½	2,781	40	1,391	20.30
Sun River, Mont.....	1½	6,000	4,000	230	153.33
Rio Grande, N. Mex.-Tex.....	415	1,982,850	4,778	31,958	77.00
Umatilla, Oreg.....	356	21,000	59	725	2.00
Strawberry Valley, Utah.....	158	273,915	1,733	4,565	29.00
Okanogan, Wash.....	3,567	35,142,750	9,852	1,030,854	289.00
Yakima, Wash.....	15,451	148,359,580	9,602	3,803,402	246.16
Shoshone, Wyo.....	14	7,790	556	78	5.56
Total and average.....	23,907	205,165,028	8,582	5,293,027	221.40



Hearts of Gold cantaloupes, Newlands project, Nev.

produced an apple crop valued at more than \$1,000,000 and reported the highest value per acre, amounting to \$289.

Detailed statistics concerning the crop are given in the accompanying table.

Large Canal in India Nearing Completion

A recent report from Bombay states that the Gang Canal of the Sutlej Valley project, which is the largest concrete-lined canal in the world, is now almost complete and its opening ceremony will shortly be performed by the viceroy at Gangagagar in Bikaner State.

The canal is lined for more than 80 miles of its course to prevent seepage losses, and will carry water for the irrigation of some 1,100 square miles of State land.

THE Garfield Gin Co. has been organized at Garfield in the Rincon division, Rio Grande project, for the purpose of erecting a cotton ginning plant to take care of the crop in that vicinity.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, attended a meeting in New York on May 1 of the American Committee of the World Power Conference to consider the reorganization of the American committee on a permanent basis. On May 3 Doctor Mead was the guest of honor and speaker at a luncheon given by the Kiwanis Club of Baltimore; and on May 8 to 10 he attended the Delta-Wide Economic Conference at Clarksdale, Miss., to consider the development of the Yazoo Delta, addressing the conference on May 10 on the subject of legislation in Congress affecting the South.

P. W. Dent, Assistant Commissioner, left Washington on May 15 for the Minidoka project, where he will give consideration to the contract with the Idaho Power Co. for the use of power developed at American Falls. He expects to return about July 1.

George C. Kreutzer, Director of Reclamation Economics, left for the West on May 15 in connection with the economic work of the bureau.

John R. Riter has been appointed junior engineer in the Denver office by transfer from the position of junior mathematician, United States Coast and Geodetic Survey, Washington, D. C., for assignment to the secondary project division.

G. H. Mehring, who was the first settler on the Bard division of the Yuma project, having made entry there on March 28, 1910, stopped recently at the Washington office in the course of a sight-seeing trip he is making across country and back in his Dodge sedan. Mr. Mehring stated that cotton and alfalfa are the principal crops grown on his farm, and that last year he made considerably more than a bale an acre on the 21 acres in cotton. He spoke enthusiastically of the possibilities of the Yuma project.

Sr. Adolfo Orive Alba, a graduate in civil engineering from the Escuela Nacional de Ingenieros of the City of Mexico, who has been commissioned by the Mexican Government to spend a year in the United States to study irrigation engineering, arrived recently at the Denver office, where he will spend about two

months in the designing section and then visit a number of the more important projects to study engineering features.

Charles A. DeKay, engineering draftsman, has been transferred from Stony Gorge Dam, Orland project, to the Belle Fourche project.

E. B. Debler, hydrographic engineer in the Denver office, and C. E. Stricklin, assistant engineer of Oregon, spent several days on the Vale project making hydrographic studies. Other visitors included Rhea Luper, State engineer of Oregon; B. E. Hayden, reclamation economist; B. E. Stoutemyer, district counsel; and F. A. Banks, construction engineer, Owyhee project.

Recent visitors on the Yuma project were R. F. Walter, chief engineer; J. Ellis Overlade, fiscal inspector; D. C. Henny, consulting engineer; and Prof. G. E. P. Smith, professor of irrigation, University of Arizona.

D. C. Henny, consulting engineer, has visited Stony Gorge and East Park Dams, Orland project, in connection with his assignment by the Secretary to report on their safety. Other visitors to Stony Gorge Dam included F. T. Crowe, J. W.

Scott, T. T. Knappen, and Mason D. Pratt.

During the month, A. J. Wiley, consulting engineer, inspected the Minidoka and American Falls Dams, Minidoka project; the Willow Creek and Gibson Dams, Sun River project; the Belle Fourche Dam, Belle Fourche project; the Pilot Butte Dam, Riverton project; the Pathfinder, Guernsey, and Minatare Dams, North Platte project; the Arrowrock, Deer Flat, and Boise Diversion Dams, Boise project; and the Shoshone Dam, Shoshone project.

D. C. Henny, consulting engineer, inspected the McMillan and Avalon Dams, Carlsbad project, and the Elephant Butte Dam, Rio Grande project, during the month.

A party of motorists from El Paso, organized by the El Paso Chamber of Commerce, visited Elephant Butte Dam recently, where they were entertained with dancing, boating, and a trip through the dam. It is planned to conduct similar trips frequently throughout the summer in order to introduce vacation sites to residents of El Paso.

Dave Hays, one of the construction engineers in the early stages of the Newlands project, was a recent visitor on the project.



Irrigating on the Klamath project, Oreg.-Calif.

APPROPRIATIONS, FISCAL YEAR 1929, ACT OF MARCH 7, 1928 (EXCLUDING CONTRIBUTED FUNDS)

Office, project, or division	Interior Department appropriation act (Public, No. 100, 70th Cong.), approved Mar. 7, 1928		Appropriated power revenues	Total appropriation available less contributed fund	Distribution by features for which appropriated											
	Direct appropriation	Reapportionment of unexpended balances			Examination and surveys	Storage system	Pumping system	Canal system	Lateral system	Drainage system	Power system	Irrigable lands	Telephone system	Operation and maintenance	Miscellaneous	Total appropriations
Washington office	\$168,000			\$168,000											\$168,000	\$168,000
Attendance on technical and professional meetings	2,000			2,000											2,000	2,000
Examination and inspection of projects		¹ \$15,000		15,000										\$15,000		15,000
Operation and maintenance of reserved works	75,000			75,000										75,000		75,000
Yuma	305,000		² \$25,000	330,000				\$30,000		\$20,000				280,000		330,000
Yuma Auxiliary		¹ 35,000		35,000										35,000		35,000
Orland	36,000	¹ 24,000		60,000		\$24,000								36,000		60,000
Grand Valley	75,000			75,000				\$2,000	22,500			\$500		50,000		75,000
Uncompagbre														(³)		
Boise	400,000	⁴ 110,000		510,000										17,000		435,000
Payette division					\$18,000	400,000								(³)		75,000
Arrowrock division							25,000			50,000						
Minidoka	1,104,000		¹ 50,000	1,154,000												
Reserved works, exclusive of power														¹ 29,000		29,000
Power system														50,000		50,000
South Side division						\$25,000	25,000		25,000					(²)		75,000
Gravity Extension Unit							1,000,000									1,000,000
Minidoka-American Falls	567,000	¹ 690,000		1,257,000		5,000				\$1,240,000				12,000		1,257,000
Milk River	44,000			44,000										27,000		27,000
St. Mary storage unit								13,200								13,200
Malta division									1,900					(⁵)		1,900
Glasgow division									1,900					(⁵)		1,900
Chinook division																
Sun River	1,159,000	¹ 25,000		1,184,000												
Gibson dam						1,130,000										1,130,000
Fort Shaw division								4,750	4,750					(²)		9,500
Greenfields division										25,000				¹ 19,500		44,500
Lower Yellowstone	180,000			180,000						180,000				(³)		180,000
North Platte			³ 75,000	75,000												
Reserved works, exclusive of power														(²)		
Power system														75,000		75,000
Newlands		⁷ 100,000		100,000		100,000								(⁵)		100,000
Carlsbad	50,000			50,000										50,000		50,000
Rio Grande	430,000	¹ 120,000		550,000					50,000	70,000		5,000		⁸ 350,000		475,000
Rincon division									3,000	5,000						8,000
Leasburg division									10,000	16,000						26,000
El Paso division									8,000	33,000						41,000
Owyhee	2,000,000			2,000,000		1,990,000		10,000								2,000,000
Umatilla (McKay dam)		¹ 5,000		5,000										5,000		5,000
Baker		¹ 447,000		447,000		447,000										447,000
Vale	750,000			750,000		150,000		506,000	88,000					6,000		750,000
Klamath	271,000			271,000												
Main division										35,000				4,000		39,000
Tule Lake								30,000	40,000	70,000		\$1,000		30,500		171,500
Langell Valley-Clear Lake										30,000				500		30,500
Refunds to lessees—Tule Lake lands															30,000	30,000
Belle Fourche	250,000			250,000					33,000	217,000				(³)		250,000
Salt Lake Basin	1,750,000			1,750,000		1,490,000		260,000								1,750,000
Okanogan														(³)		
Yakima	788,000			788,000												
Sunnyside division														145,000		145,000
Tieton division														100,000		100,000
Storage division						500,000								43,000		543,000
Yakima-Kittitas division	1,500,000	¹ 300,000		1,800,000				1,449,500	328,000			7,500		15,000		1,800,000
Riverton	430,000	¹ 183,000	² 20,000	633,000										30,000		76,000
Pavillion division									5,000	41,000						537,000
Pilot division								346,000	175,000			10,000	6,000	20,000		20,000
Power system																
Sboshone	160,000	⁸ 21,000	² 20,000	201,000										(³)		115,000
Gariand division										115,000						31,000
Frannie division										20,000				⁸ 11,000		35,000
Willwood division										25,000				10,000		20,000
Power system														20,000		75,000
Secondary	75,000			75,000	⁹ 75,000											
Economic surveys and investigations	75,000			75,000	75,000											75,000
Total, reclamation fund	12,644,000	2,075,000	190,000	14,909,000	168,000	6,236,000	25,000	3,699,450	750,550	999,500	1,240,000	23,000	7,000	1,560,500	200,000	14,909,000
Colorado River front and levee system	100,000			100,000										100,000		100,000
Swamp and cut-over timberlands investigations	15,000			15,000	15,000											15,000
Total, bureau of reclamation	12,759,000	2,075,000	190,000	15,024,000	183,000	6,236,000	25,000	3,699,450	750,550	999,500	1,240,000	23,000	7,000	1,660,500	200,000	15,024,000

¹ Reappropriation for same purposes.² Not to exceed these amounts appropriated from power revenues for operation and maintenance of commercial system.³ Advanced.⁴ Reappropriation of 1927 unexpended balances for Payette division, operation and maintenance, \$17,000; for investigations, examination, and surveys, \$18,000; for continuation of construction Arrowrock division, \$75,000.⁵ Additional funds advanced for operation and maintenance by water users.⁶ By district.⁷ Reappropriation for reconstruction of Truckee Canal.⁸ Reappropriation for operation and maintenance for Frannie division, \$11,000, and for Willwood division, \$10,000.⁹ Additional funds advanced for surveys and investigations of secondary projects.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C.
A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Sieheneicher.....	.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	E. E. Chahot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	Erle W. Shepard.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Huhbell.....	Virgil E. Huhbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weher.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....	C. C. Cragin.....	.....	.....	.....	.....
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigant, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philbaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹²	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹²	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹²	C. B. Funk.....	.....	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Albuquerque, N. Mex.....	.....	Middle Rio Grande conservancy district.
Heart Mountain Investigations.....	Powell, Wyo.....	I. B. Hosig.....	.....
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.



EAST PARK DAM AND SPILLWAY
ORLAND PROJECT, CALIFORNIA

NEW RECLAMATION ERA

VOL. 19

JULY, 1928

NO. 7



A PROMISE FOR THE FUTURE UNDER IRRIGATION

RECLAMATION PLANK
IN REPUBLICAN PARTY
PLATFORM

FEDERAL reclamation of arid lands is a Republican policy, adopted under President Roosevelt, carried forward by succeeding Republican Presidents, and put upon a still higher plane of efficiency and production by President Coolidge. It has increased the wealth of the Nation and made the West more prosperous. ¶ An intensive study of the methods and practices of reclamation has been going on for the past four years under the direction of the Department of the Interior in an endeavor to create broader human opportunities and their financial and economic success. The money value of the crops raised on reclamation projects is showing a steady and gratifying increase as well as the number of farms and people who have settled on the lands. ¶ The continuation of a surplus of agricultural products in the selling markets of the world has influenced the department to a revaluation of plans and projects. It has adopted a 10-year program for the completion of older projects and will hold other suggestions in abeyance until the surveys now under way as to the entire scope of the work are completed.

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

HUBERT WORK
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

JULY, 1928

No. 7

Interesting High Lights on the Federal Reclamation Projects

AT Stony Gorge Dam, Orland project, concrete placed during the month amounted to 2,256 cubic yards, bringing the total to June 1 to 40,404 cubic yards, or 93.7 per cent of the concrete for the whole structure. Two of the spillway gates had been assembled and were being riveted, and the 50-inch outlet pipes had been placed.

THE American Crate & Basket Co. has begun the operation of a plant at Grand Junction, Grand Valley project, for the construction of crates and baskets for the fruit industry.

AMOVEMENT is on foot to extend the poultry industry on the Grand Valley project, patterned after the methods of the Utah Poultry Association. Conditions appear to be ideal on the project for raising and marketing all kinds of poultry, including turkeys.

THROUGH the efforts of the Grand Valley Water Users' Association, which has served notice on all delinquent water users that their lands are subject to foreclosure and that such action will be taken unless prompt payment is made of delinquent charges, a considerable number of water users have made payments and several have offered to deed to the association the tracts which they hold and are unable to handle in any other way. The association plans to prosecute this matter diligently and, if necessary, take title to a considerable area of the vacant farms, holding them for resale at prices which should cause their prompt development.

COLLECTIONS for May, 1928, on the Tieton division, Yakima project, amounted to \$44,454.93, compared with \$29,006.69 for May, 1927. The delinquent list on this division, which amounted to 6,592 acres at the beginning of the irrigation season, has been reduced to 830.2 acres, including 237.5 acres of land that has reverted to the State and for which no appropriation is yet available.

GRASSHOPPERS have made their appearance in the Tule Lake area, Klamath project, and a vigorous campaign of poisoning is being waged against them. During the latter half of the month more than 300,000 pounds of poison bran mash had been used in an effort to rid this section of the pest.

ON May 12 the Great Northern Railway branch line between Bend and Klamath Falls, Oreg., was officially opened. The distance between Klamath Falls and Bend is about 150 miles, of which about half is over the Southern Pacific track and half over a new line built or acquired by the Great Northern. This new road opens a direct eastern outlet from southern Oregon territory near the Klamath project.

LOCAL resident farm owners on the Belle Fourche project are making consistent progress in improvements, chiefly in repairs and additions to dwellings. Two new houses have recently been completed. With the assurance of a good crop, it is anticipated that many more resident owners will make improvements this fall.

GOOD progress was made during the month at Echo Dam, Salt Lake Basin project, the work consisting of tunnel excavation, outlet channel excavation, stripping of the dam and borrow pits, excavation of the cut-off trench, stripping of gravel pit, and shaft excavation.

MATH SCHUMACHER and son, Holstein breeders on the North Platte project, who have been searching for months for a bull bred along the Ormsby Bess Burke blood lines, finally succeeded in buying a son of Marathon Bess Burke from Stephen E. Chaffee, Sunnyside, Wash., Yakima project. This calf, Glencliff M. B. B. Cascade Jessie, is a son of the renowned sire Marathon Bess Burke, noted as the richest bred Ormsby Bess Burke bull of the breed.

THE settlers on the Willwood division of the Shoshone project met recently with the manager of the Project Telephone Co. and as a result plans are being made for the company to extend a line from Powell to the Government telephone line on the division.

WATER users north and west of Powell, Shoshone project, have organized a company for the construction of a rural power line. They have purchased 80 transmission line poles and are carrying the work to completion as fast as the other materials can be obtained.

THE placing of the bitulithic paving on the 5 miles of Federal-aid highway east of Yuma is progressing rapidly and will be completed early in July. Construction work is satisfactory on the new Yuma courthouse.

ARRANGEMENTS are being made by the unit holders on the Yuma Mesa to form an association to market the citrus crop. They plan to erect a packing shed to handle the crop, as it is believed that the area in producing orchards next season will justify this expenditure.

ASPECIAL meeting was held recently of the directors and stockholders of the Glenn County Livestock and Agricultural Association at which it was decided to hold the annual fair at Orland this year some time during the latter part of September or early in October.

AREFRIGERATION plant has been equipped and placed in operation for the first time at Chinook, Milk River project. This plant was financed by local capital and constructed chiefly to handle poultry products.

AT Gibson Dam, Sun River project, 19,300 cubic yards of concrete were placed during the month, making a total at the end of May of 45,300 cubic yards, with 115,000 cubic yards still to be placed.

Economic Conditions and Settlement Difficulties on the Milk River Project, Montana¹

By H. H. Johnson, Superintendent

THE Milk River project comprises an area of approximately 143,500 acres of irrigable land, situated in the semiarid region of northeastern Montana. The land is particularly adapted to the production of forage, cereal, and the more hardy vegetable and root crops suited to the northern climate. The winters are rigorous, but the long summer days of this latitude induce a rapid and highly productive plant growth. Excellent marketing and transportation facilities are provided by the transcontinental line of the Great Northern Railway system, which traverses the project. In general project conditions are favorable for the maintenance of a successful system of agriculture.

PROJECT DEVELOPMENT SLOW

Approximately 100,000 acres of land with fertile soil are provided with an adequate irrigation system and water supply. Although water has been available for use since 1915 and the project practically completed since 1923, only about 40,000 acres are actually irrigated, and about one-third of this area is given to the production of low-yielding crops totally unfitted to the intensified methods of irrigated farming.

This retarded development can be attributed principally to the fact that during the period of rather rapid settlement of many other irrigated areas this project apparently did not offer comparable opportunities for a sound agricultural development. Until recent years the northern portion of Montana was considered as suited only to mining and stock raising, with very limited agricultural possibilities. In this particular locality agriculture was confined almost entirely to the cutting of native hay from large areas for the winter feeding of livestock and the production of small grains under dry-farm methods during seasons of sufficient rainfall. For many years no other crops were considered adapted to the locality, and experience has proven that such crops alone do not establish a profitable basis for irrigated agriculture. There was no particular incentive to use water for the production of wheat since practically as good crops were produced from adjacent dry lands in favorable years without the additional labor and cost of irrigation. With the improvement in dry-farm methods of recent years and the resultant increasing certainty of such crops, the development of the locality has been confined almost

entirely to these dry lands and the irrigated areas have lain practically dormant.

CROP METHODS CHANGING

Several unsuccessful attempts were made during past years to produce various high-yielding cash crops. In 1923 the growing of sugar beets was first attempted under the supervision of the Utah-Idaho Sugar Co., and the experience of the past four years has proven the project lands to be capable of producing a superior quality of this product with exceptionally high yields. A sugar factory is now located upon the project, and during the past season 2,488 acres of beets were grown, yielding 24,249 tons, with an average sugar content of 18¼ per cent. With the continuing rapid increase in cropped acreage, this factory should be operating at full capacity by 1930.

During this period also the production of certified seed potatoes has gradually developed to a commercial scale, and excellent returns are now being yielded to the good growers of this crop. Recently about 60 cars of seed stock were shipped from the project at prices ranging from \$2 to \$2.50 per hundredweight, during a period when there was practically no market for the ordinary table stock potato. The demand for these potatoes by southern growers is increasing annually, owing to their excellent quality and the high standard of certification maintained by the State, and their production promises to become a permanent and profitable venture.

These industries have passed the experimental stage and are finally established as a sound basis for future project agriculture, and if colonization of the idle lands can be obtained the Milk River should soon be classed among the successful Federal reclamation projects.

IRRIGATION COSTS LOW

Previous to 1926 construction charges had not been definitely determined and water had been supplied on a rental or pay-as-used basis. Following recent adjustment legislation, contracts were executed with irrigation district organizations which fixed project costs and definite terms for the repayment of both original construction and operation and maintenance expenditures, these payments to be met by annual tax levy on all lands. In negotiating these contracts consideration



An irrigated apple orchard

¹ Address given at Settlement and Reclamation Conference, Washington, D. C., Feb. 14-15, 1928.

was given to the poor state of development and the inability of the lands to meet full payments at once. During the next five years taxes therefore will be light, varying from 50 to 75 cents per acre to meet operation and maintenance costs only. Construction repayment will not start until 1932, and 40 years will be allowed to liquidate this debt of \$57 per acre, requiring a levy of \$1.42½ per acre per annum. These contracts create a joint liability for all lands upon the district, and the annual proportion of the total obligation must be met each year without regard to individual default.

As compared with many other reclamation projects, even this ultimate rate of taxation will be low and well within the productive ability of the lands to meet. Nonproducing lands, however, can not meet even these small charges and their eventual default in payment is certain. Under such conditions it will be impossible for a small producing area to carry the entire burden of payment, and failure of the districts to meet the contracted obligations is inevitable. Although these districts have been functioning for two years and are still on a sound business basis, there are some tax delinquencies, almost entirely by nonproducers, which under present conditions will increase rapidly. The financial stability of these organizations and the security of the Government investment therefore lies in the rapid development of the non-producing lands.

ATTITUDE OF LANDOWNERS CHANGING

Practically the entire irrigable area is in private ownership, a great portion of it being held in large tracts by individuals or public corporations, many of these having extensive commercial interests and either can not or do not desire to cultivate the lands. Until the execution of the repayment contracts little more than a passing interest in settlement had been taken by these landowners generally. The attitude in many cases has been that the future would care for itself and that when there was a real demand by new settlers the lands would move with little other action necessary. Until the pressure of irrigation tax levy was felt there had been no particular incentive to dispose of excess lands, especially to those with unpatented, nontaxable holdings. It was costing little or nothing to hold the lands, and although little or no income was yielded it was considered good policy by many to wait until a general improvement in agricultural conditions would bring about a higher level in land valuation. There has been a gradual change in this attitude, however, during recent years, due principally to the levying of two small assessments and a realization that

these assessments will increase until 1932. At present there is a rather general feeling that the future success of the project lies in the subdivision and disposal of the large tracts to induce more intensive farming and the cultivation of high-yielding cash crops.

In the past a few, principally non-residents, have held their land for speculative purposes only, but those who are familiar with project conditions are convinced that there is now no speculative value in the irrigated lands of the Milk River Valley. They realize that the costs incident to sound irrigation development are high and that such development can result only through the marketing of lands on terms that will offer the settler with little capital an opportunity for success. The present desire of those with large holdings is to dispose of the lands on any favorable terms and get from under the prospective burden of taxation. Several landowners have made tentative subdivision of their lands into smaller tracts and offered them for sale at reasonable prices, providing liberal terms of payment. Others have already disposed of their excess holdings to local buyers on crop-share terms, in order that the land may be placed in immediate productivity.

MORE FARMERS NECESSARY

A recent survey of agricultural and settlement conditions as they existed during 1926 discloses the following facts: 109,000 acres of irrigable land for which water supply is available were held by 792 owners, with an average holding of 144 acres, many tracts, however, varying

in size from 320 to 1,500 acres; 359 of these tracts were farmed by 331 operators, 36 per cent of whom were tenants, and only about 25 per cent practicing good cultural methods. The average area cultivated per operator was 120 acres. Very few tracts were tilled in their entirety, and in many cases a single operator would attempt to handle from 300 to 600 acres. As a rule only the best and most conveniently handled lands were in cultivation, while large areas of slightly poorer character lay idle or produced nothing but native hay. Many of these large tracts, poorly farmed by one man and producing only low yields of hay and grain, would if intensively cultivated yield three or four families an equal or greater gross revenue. Many farmers are guided in their practices by the large scale dry-land methods which up to date have been the predominating and most remunerative type of agriculture in the locality. Others feel that each acre of land must be made to pay its own way, and there is a very prevalent tendency even among the more progressive farmers to spread their labor too thin. Although there is some opportunity for improvement in methods by present farmers, and such improvement is taking place to some extent through beet and potato culture, yet this possibility is limited, both through the lack of farming population and the inability of these people to adapt themselves to intensive agriculture. To accomplish the necessary development the project must be colonized preferably by people who are experienced in irrigation farming, or if inexperienced can adapt themselves to intensive farming methods and have the



Reclamation project slogan: A flock on every farm. Belle Fourche project, S. Dak.



Irrigated barley up to your neck, Klamath project, Oreg.-Calif.

real desire to become owners of farm lands.

There is sufficient good land available for settlement to accommodate approximately 350 additional families, and at least this number will be required to assure the solvency of the project. While it is realized that desirable settlers are scarce at the present time, still it is fairly certain that if some of the difficulties which stand in the way of settlement could be removed a conservative orderly development might result which would reduce the present financial hazard to a great extent. If sound colonization is started and full utilization made of at least a portion of the project's resources, the advantages which the locality offers in the way of easy payments and productive power of lands would be evident and the probability of complete development greatly enhanced.

DEVELOPMENT COSTS HIGH

Experience in the reclamation of the arid West has proven that the cost of developing a piece of raw land into an irrigated farm is high and the returns during the first few years small. The problem confronting the agencies attempting to colonize the project is to obtain good settlers who have sufficient capital to meet the expenditure and are willing to undergo the labor and hardships attending such development. Data compiled from the experience of several good farmers who have developed small tracts into highly productive farm plants show that the capital outlay during the first two years exceeds returns by approximately \$4,000.

Very few people who have this amount of capital desire to risk it in an agricultural venture, as more attractive commercial or industrial opportunities for investment are offered. Those who are agriculturally inclined do not need to pioneer but can purchase a well-improved farm on a paying basis in practically any locality desired. We must depend for our settlement principally upon young people who, though with very limited assets, have the energy necessary for success and the desire to become landowners. The great problem is, therefore, how to make a few hundred dollars do the work of a few thousand.

In spite of the hypothetical capital requirements, several people with less than \$1,000 have come onto the project during the past few years, have developed their lands, and become successful farmers, who are an asset to the community. These people did not, however, make a great initial investment in land or farm buildings, and in most cases were able to secure some financial aid from landowners. During the past two years the agricultural development agency of the Great Northern Railway Co., which is rendering valuable service to the State of Montana in colonization of its vacant lands, has placed on other projects, principally those which have no better agricultural possibilities than the Milk River, approximately 70 families, whose capital varied from nothing to \$400, in addition to a small amount of stock and equipment. These people were all experienced farmers, have developed their lands, and give every

promise of becoming prosperous and satisfied settlers. Success in these cases was achieved through cooperation among themselves, and by the railway development agents, consideration by the landowners in the purchase and improvement of land, and assistance by local agencies in the way of credit to supplement their meager capital.

It is usually impossible for a settler of these limited resources to come to the project, purchase a piece of land, erect buildings, equip the farm with the necessary tools, implements, and livestock, prepare the ground for crop, and live upon the returns alone during the development period. Some help must be obtained from other sources. Usually the purchase of land and the erection of buildings alone will impair his capital to such an extent as to preclude further operation, and under such circumstances failure is almost certain before the real development has started.

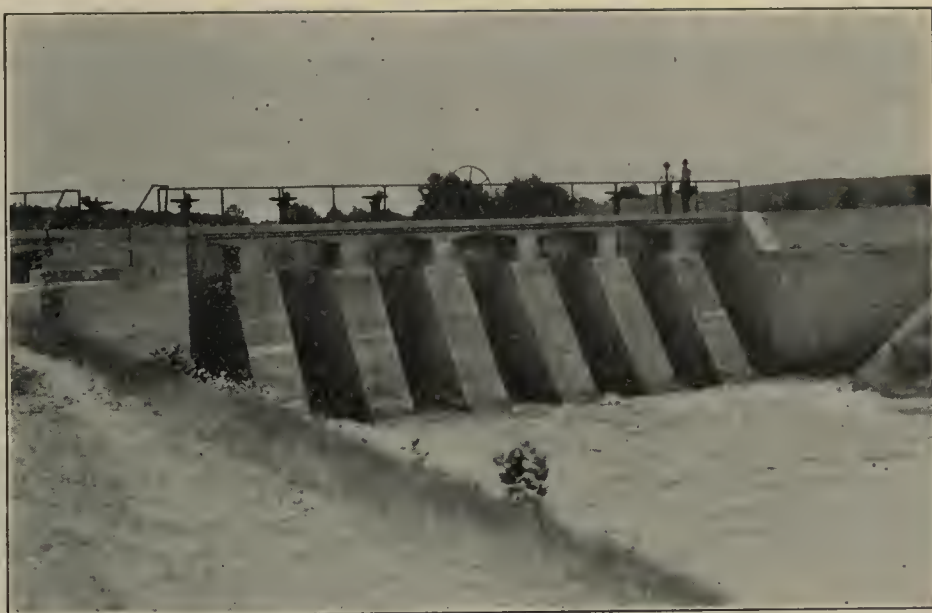
On the Milk River project initial land payments and future terms will be adjusted by the landowners if responsible settlers can be obtained. The matter of great importance at the present time is that of supplying adequate housing facilities for families and livestock. The pioneering spirit of the old free homestead days has passed, and in order to secure the cultivation of these idle lands buildings of some nature must be provided upon each unit, either by the settler or through the finance of the landowner. The recent survey shows that of the 350 tracts which should be settled, 333 have no buildings,

a few having buildings may be remodeled or repaired and made habitable at a moderate cost. In many cases landowners are willing and able to invest the additional capital necessary to provide buildings, and include with land costs, provided a purchaser can be found who really desires to improve the land and establish a permanent home.

These men will offer their holdings at terms which will be attractive to this type of people. However, none are willing to undertake the expense of such improvements until a bona fide settler is in sight. Buildings deteriorate rapidly through non-use, and it is not considered good business to make capital investment in a commodity which will yield no return and gradually decrease in value. We seem to be at a standstill on propositions of this kind. The landowner says, "Show me the right purchaser and I will build the buildings"; the settlement agent says, "Show me the buildings and I will bring the settler"; and to date no settlers have appeared.

Other owners are willing to waive the down payment on land and allow this amount to apply on the purchase of material for buildings. This method of course involves capital outlay by the settler and usually does not provide enough funds to erect adequate buildings.

Many landowners, however, with large holdings, who are willing and desirous of subdividing and disposing of their lands at reasonable prices, are not financially able to construct the number of buildings as a necessary prerequisite to the sale of several units. In very few cases is it possible for such landowners to finance a venture which involves a capital outlay of several thousand dollars. It might be considered good policy to let the development of such farms lag until the pressure of taxation forces the necessary improvements which will effect sale. Those, however, who can not afford to invest additional capital will be the first to become delinquent in taxes and practical confiscation will result. Such landowners would almost invariably be willing to borrow sufficient capital, giving first-mortgage security, to undertake this enterprise if there were any agency through which such funds could be obtained. The local banks will not consider loans of this nature, as the security is not first class. Neither do interest rates involved, which must be assumed by the settler, make such loans feasible as an agricultural development proposition. Loans through the Federal land bank are still impossible to obtain for two reasons: First, a great number of the farms still remain unpatented and the title is not merchantable; second, when the prior lien on account of construction charges is considered in connection with the low productive ability of unimproved



Inlet canal headgates, Belle Fourche project, S. Dak.

or partially improved lands, little borrowing power remains and the risk is too great.

Practically all of the farms with buildings are occupied and it is very evident that little advance will be made in project settlement until some certain means for the financing of these needed improvements have been provided.

A suitable house and barn will cost approximately \$800, provided the settler furnishes part of the labor. The erection of approximately 300 sets of buildings will involve an expenditure of at least \$240,000. The recent survey shows that approximately one-third of these buildings will be furnished by private capital if good settlers can be obtained. To assure completion of the necessary development, therefore, would require additional capital from some outside source to the extent of approximately \$150,000. If this amount were available during the next five years at favorable interest rates and terms of repayment, the greatest obstacle in the way of project settlement would be removed.

CREDIT REQUIRED FOR OTHER PURPOSES

Provided satisfactory arrangements can be made in the purchase of land and the erection of buildings, the settler's financial problem is not solved. At least \$2,500 should by some means be available for the purchase of stock and equipment, fencing and breaking the land, seeding and harvesting the crop, and living until some returns are yielded from the farm. In some cases during the past very great assistance has been rendered by landowners in these items of expenditure; however, as a rule, the settler must depend to a great extent upon his resources and his ability through honest effort to quickly establish a reasonable credit.

As the local communities at present are in a very prosperous condition through revenue obtained from the dry lands adjacent to the project, and are not dependent upon the project lands for support, the incentive to assist in development by commercial interests is not as great as in the more arid localities where revenue is dependent entirely upon irrigation. A rather costly experience in the financing of a poor itinerant type of settlers during 1925 has served to make the business interests very conservative with regard to new settlers on the irrigated lands until they have proven themselves worthy of credit. However, the local mercantile establishments are as a rule on a very substantial basis and in a position to extend a certain amount of credit in the purchase of farm machinery and other necessities when credit has been established. The local banks, although very conservative, are capable of supplying small amounts of capital on short-time loans for farming operations. Such chattel loans, however, bear interest at 10 per cent and are of little advantage to the irrigation farmer of small means, and are not encouraged except in cases of emergency. The sugar company is liberal in the financing of beet-growing operations within the limits of estimated crop production. The agricultural credit corporation has placed a considerable amount of money upon the project during the past few years in livestock loans. At the present time there is some activity toward the financing of a local corporation for the handling of loans through the intermediate credit organization of the Federal land bank. These institutions are organized principally to take care of the needs of responsible farmers in livestock finance. As a rule, however, both the direct and indirect financial aid which

a farmer receives will depend entirely upon himself, and his ability to show that he desires to increase his own assets and thereby assist in the general welfare of the community.

INDIVIDUAL EFFORTS NOT LACKING

The project does not need to depend to a great extent on financial assistance from the outside, as the impetus of private endeavor necessary in a development of this nature is by no means lacking. Several cases might be cited of individuals who are making great strides in the improvement of their holdings and in assisting worthy settlers to become home owners. This individual effort is usually being undertaken by substantial business men of the project with extensive land holdings and sufficient foresight to realize the result if their lands are not producing when the construction tax of \$1.42 per acre attaches in 1932. Numerous other landowners of equal foresight and ability realize the necessity for such improvements, but are handicapped by the lack of sufficient funds to initiate and carry on the necessary program.

It is understood that a certain public corporation which has a large investment in the bonds of one district whose construction work was not financed entirely by public funds is at present arranging to acquire a considerable area of delinquent lands through tax title, and will immediately expend several thousand dollars in the improvements necessary to secure settlement and development. This move is being made in an attempt to strengthen the financial condition of the district in the security of a large investment already made.

SETTLERS ARE AVAILABLE

A recent campaign of the project was made by settlement agents of the Great Northern Railway in an effort to secure tracts of land upon which beet growers could be placed during the coming spring. Approximately 18 tracts were obtained with land partially developed and in condition for this crop, where living quarters could be provided. Several of these tracts were given for lease during the coming season, with an option to buy after harvest. The settlers who are expected to be placed on these lands are experienced farmers who desire to locate upon the Milk River project, having very little money but guaranteed to become successful if given the proper opportunities. No definite assurance has been given that settlers would be obtained for these propositions, but the chances seem very good that people can be placed upon every piece of land offered which has suitable buildings. However, attempts to colonize the unimproved land will be futile as the prospective settlers have no money to invest in improvements and a crop must be assured this fall.

Considerable favorable advertising of Montana's agricultural possibilities has been received during the past several months on account of the improvement in general prosperity and business conditions resulting from the excellent wheat crop of the past season. Certain authentic charts showing the general trend of business conditions have designated the entire eastern portion of Montana as white for the past three months, which is the largest agricultural section of the Nation enjoying this

distinction. While this condition has resulted primarily from the dry lands, the effects will be reflected to the irrigated areas. Numerous requests for information concerning the project have been received during the past 60 days, which indicates that attention of home seekers is being directed this way. Those, therefore, who are interested in the development of these irrigated areas naturally desire to be in a position to secure the maximum benefit from this favorable advertisement of Montana agriculture.

SOLVENCY DEPENDENT UPON SETTLEMENT

Approximately \$7,000,000 has been expended through the reclamation fund in the construction of the Milk River project, and the greater portion of this must be repaid within the next 40 years. There is at present a period of five years in which to improve economic conditions in such a manner that the project may successfully assume this burden of repayment. During this period irrigation costs will be low and the capital which ordinarily would be put into construction charges may be used in land development. If the obstacles which now stand in the way of settlement can in some manner be removed this great investment of public funds is fairly secure, but if this settlement is not obtained the future financial solvency of the project is very doubtful.

Filing System Booklet Is Widely Distributed

Some months ago the Bureau of Reclamation published a booklet by J. W. Myer, chief of the mails and files section of the Washington office, and J. C. Beveridge, jr., principal assistant, describing the office system and filing system in operation in the Washington office.

Of the 1,000 copies printed, 815 had been distributed, largely on request, by the middle of June. These copies were sent to schools and colleges of business administration, Federal, State, and city offices, educational magazines, filing and office equipment manufacturers, libraries, public utility companies, labor organizations, and to many private individuals. Requests for the booklet were received from 34 States, the District of Columbia, Hawaii, Canada, Porto Rico, France, and Australia; and a large number of favorable comments were received on the basic excellence of the system and the clarity with which it is described in the booklet.

Copies may still be obtained on request as long as the supply lasts.



Strawberries for everybody

Replacement of Portion of Mabton Siphon, Sunnyside Division, Yakima Project, Washington

By David E. Ball, Junior Engineer



Mabton siphon before and after replacement

INCLUDED in the regular maintenance program for the fiscal year 1927-28 was the replacement of about 950 linear feet of the south end of the Mabton pressure pipe. The portion to be replaced was 55¾ inches of untreated, continuous wood-stave pipe of Douglas fir, the staves being 2½ inches thick and 5½ inches wide. The bands were ⅝ inch in diameter and made up of two pieces, one half being threaded on both ends, the other half headed on both ends.

This portion of the Mabton siphon was constructed in 1909. In 1913 the pipe was uncovered to arrest its rapid depreciation. When this replacement was begun in 1927, the pipe lay in a trench from 4 to 8 feet in depth, 7 feet bottom width, with side slopes of ¼ to 1.

The replacement was made with 56 inches of continuous, creosoted wood-stave pipe of Douglas fir, the staves being 2 inches in thickness, with 34 staves to the circumference.

In order to provide ample room around the pipe for future maintenance, the pipe trench was widened to 9 feet at the bottom and given side slopes of 1¼ to 1. Shallow gutters at each side of the trench were provided for drainage. Approximately 650 feet of the excavation was in gravelly soil and 250 feet in saturated material.

CONCRETE SUPPORT PEDESTALS

The pipe is supported on reinforced concrete pedestals, except for a distance

of 184 feet where the uncertain footing made their use impractical. In this soft material a coarse gravel foundation about 18 inches deep for the full width of the trench was placed. Wooden pedestals with footings 2 feet wide resting on this foundation support the pipe. After erection, gravel was placed between the wooden pedestals and rammed in place to further guard against possible settlement. All pedestals are 8 inches in thickness, 5 feet 4 inches in width, in contact with a 120° arc of pipe surface, and are spaced on 8-foot centers. A clearance of 12 inches between the subgrade and the bottom of the pipe was provided where concrete pedestals are used.

The old bands and shoes were used in rebuilding. Because of the slightly smaller outside circumference of the new pipe, it was necessary to shorten the bands about 3 inches. The headed half of each band was shortened and reheaded. All bands were cleaned and dipped in coal tar.

The pipe was first erected with only a sufficient number of bands in place to hold the pipe in shape. Then all bands were put in place and given their final spacing and tightening.

Because of the rather steep gradient of the pipe, a 3-inch gravel blanket was placed on the bottom of the pipe trench to prevent erosion which might result from leakage. When water was turned into the line in the spring of 1928, the leakage checked quickly and within two

hours the amount of leakage in the replaced portion of the line was almost negligible.

For the most part the work was performed by forces regularly employed on operation and maintenance work. Snow and cold weather interfered somewhat with the execution of the work during December and January. The dismantling, excavation, and erection were done under the direction of C. A. Chrestenson, water-master on the lower division. The pedestals were built under the direction of D. L. Carmody, maintenance engineer.

The total field cost of the structure was \$8,457.49, as against the estimated cost of \$8,541.17. The accompanying table gives the full costs detailed as to the main features:

Mabton Siphon replacement

Kind of work	Unit	Quantity	Total cost	Unit cost
Dismantling.....	Linear feet.	943	\$212.86	\$0.23
Excavation.....	Cubic yards.	1,544	849.65	.55
Foundation and gravel blanket.	Cubic yards.	370	275.45	.74
Pedestals, concrete..	Each.	95	1,280.89	13.48
	Cubic yards.	31.5		40.66
Pedestals, wood.....	Each.	23	193.42	8.41
	F. b. m.	2,000		96.71
Collar, concrete.....	Each.	1	31.63	31.63
Pipe in place.....	Linear feet.	943	5,613.59	5.95
Total cost.....	Linear feet.	943	8,457.49	8.97

Submission of Data for Designs and Estimates

By W. H. Nalder, Assistant Designing Engineer, Denver Office

THE chief engineer is responsible for all engineering work of the Bureau of Reclamation. Under him the chief designing engineer is charged with the preparation of all designs of the bureau and for other engineering work assigned to and performed by the engineering section of the Denver office. The engineering section is subdivided into the electrical, mechanical, dam design, canal, research, and drafting divisions, each in charge of a selected engineer. The personnel includes a complete and competent force of engineers, designers, and draftsmen, selected and trained to do all classes of designing work required by the operations of the bureau. The engineering section is also equipped with an extensive library of technical books, engineering periodicals, trade catalogues, and other data, and is prepared to do research work and to furnish advice relative to engineering subjects requiring access to such data not usually available at the field offices. The superintendents and other responsible field men of the bureau should make the greatest possible use of this expert organization.

DESIGNS TO BE PREPARED IN DENVER OFFICE

Designs should be prepared in the Denver office for all major structures and all minor structures of special or unusual nature and all other structures for which designs may be requested by the field offices and for which standard designs or previously approved types of designs are not available. Standard designs for the more common canal and lateral structures, and of gates and other metal work common to all projects are being prepared as demand arises and conditions permit. In addition, the designing engineer is required to review and check for approval all designing done by the project or other field offices; to make or review all engineering studies carried out by the bureau; to make or check all estimates of cost upon which approval of work is based; to review and check the engineering and cost features involved in all reports on projects being investigated; to check for approval construction contract specifications prepared in the field and to prepare such specifications for the major structures and for the purchase of engineering machinery; and to do other engineering work assigned.

REQUIREMENT FOR DATA

This engineering work is of great importance and requires for its proper execution complete and accurate data as to field conditions. Although, to a

limited extent, it is possible for the designing engineer and some of his assistants to visit and investigate the work under consideration in the field, dependence must, in general, be placed on the field forces for the necessary information and data. It is the object of this paper to point out the requirements to be met in submitting these data which are found necessary in view of the experiences had during the 12 years since the Denver office was established. In order to develop these requirements more logically, the work will be considered under five general groups.

Project Water Supply

May was warm and dry on most of the projects, favorable for agricultural conditions, and conducive to an early and heavy run-off on most of the streams.

Irrigation demands were especially heavy on the projects in Montana and Idaho and on the Yakima project in Washington. Floods on the Snake River were averted by operating reservoirs for control. At Yuma the Colorado River will probably reach its peak on June 12, with a flow of about 105,000 second-feet. The peak flow of the Shoshone River was the highest since 1918.

At the end of the month, storage reservoirs were generally well filled, and while the early run-off indicates a deficiency in late summer flow in many of the streams, no serious shortages are anticipated on any of the projects. Conditions on the Okanogan and Carlsbad projects were materially improved during the month by increased storage and prospects on both projects are now favorable for a reasonably adequate water supply. On the Orland project an early draft on storage indicates that a slight shortage will be experienced at the end of the season.

CANAL STRUCTURES

The first group comprises canal structures. These include all structures on canal and drainage systems. For these the conditions controlling their design are usually quite definitely fixed. The hydraulic and operating requirements and the foundation conditions are usually known or ascertainable. The availability of suitable construction materials and the probable cost can generally be accurately determined. For convenience and uniformity in submitting data for the design of such structures, printed Forms Nos.

7-882 and 7-882a to 7-882o, inclusive, have been made available, as follows:

Form No.	Structure
7-882.....	Check.
7-882a.....	Chutes.
7-882b.....	Culvert under canal.
7-882c.....	Culvert under railroad.
7-882d.....	Culvert under road.
7-882e.....	Diversion dam.
7-882f.....	Drop.
7-882g.....	Farm turnout.
7-882h.....	Flume.
7-882i.....	Head gates at diversion dam.
7-882j.....	Highway bridge.
7-882k.....	Lateral turnout.
7-882l.....	Siphon.
7-882m.....	Siphon spillway.
7-882n.....	Tunnel.
7-882o.....	Wasteway.

These forms are, in general, satisfactory for the purpose intended. They are intended to be an aid and convenience to the superintendents and others for this purpose as well as an insurance to the Denver office that complete data will be submitted and they should always be considered and used as such. It has been quite generally observed that when these forms are used the design data furnished are more complete, accurate, and satisfactory than when they are not used. This is logical because the most usual fault in submitting design data is in overlooking some essential item which the printed forms help to avoid. The filled in forms should be supplemented wherever necessary or desirable by maps, drawings, photographs, discussions, computations, or other data. They should especially be supplemented by such data as accurate profiles or sections upon which such pertinent information as classification of excavation, foundation and ground water conditions, highwater elevations, etc., are clearly shown. Single copies of these data will meet all the requirements.

It is important that the correct form be used for each structure. Where this has not been done it has often been found that essential data are overlooked, or those given are subject to misinterpretation. The data should be carefully checked to ascertain that the answers given to the different questions on the forms are consistent with each other and with the drawings and other data submitted. This, of course, is obvious and applies equally to all data of whatever nature submitted. Failure to do this, however, has been a common source of difficulty and delay in the preparation of designs and estimates. When inconsistent data are submitted the work must usually be delayed until the inconsistencies are straightened out by correspondence, or many times by telegraph at an expense otherwise not necessary.

DESIGNS PREPARED IN FIELD OFFICES

In so far as practicable all important designing work should be done in the

Denver office. Only such simple designing work should be done in the field offices as can be advantageously performed by the forces regularly employed for other engineering work and without interference to that work. Designing in field offices should be limited to minor structures for distribution systems and the adaptation to conditions of standard or previously approved typical designs. All such designs should be submitted to this office for approval before construction. The intelligent review for approval of designs prepared in the field requires, as a general rule, the same data and information as would be required for their preparation. Many designs and estimates have been submitted for approval with little or no data given as to hydraulic or structural requirements or as to the controlling conditions, and for which, upon review, the best recommendation that could be given to the chief engineer was that "there is no apparent objection to them." Such a review is of little or no value and forms no adequate basis upon which to approve the construction or expenditure involved. It is especially necessary that complete data be submitted with designs for structures of an unusual or novel nature. Freak or experimental designs are not viewed with favor. New and untried designs should be adopted only with caution and only after they have been demonstrated to be practical and better than the usual type of structure.

DAMS AND OTHER LARGE ITEMS

The second group of structures for which data must be submitted for design

and estimate are the major items, such as large dams or reservoirs. The magnitude of these structures is so great, the especial circumstances surrounding each one are so varied, and their importance to the project of which they are a part is such that fixed rules or forms for submitting data for them are not practicable. The following check list, however, gives items commonly to be considered in reporting on reservoir sites:

I. Reservoir.

1. Topography.
2. Capacity table or curve (table preferable).
3. Area table or curve (table preferable).
4. Geological report.
5. Description of reservoir area, timber, etc.
6. Drainage area.

II. Climate and stream flow.

1. Precipitation; annual and monthly distribution.
2. Temperature; range annual and monthly.
3. Stream-flow data for all years available.
4. Maximum floods of record.
5. Prior rights to flow of water.

III. Right of way.

1. Reservoir; classification of all lands.
2. Dam site.
3. Borrow pits for embankment material.
4. Borrow pits for concrete material.

IV. Topography.

1. Reservoir area, small scale.
2. Dam site, large scale (including spillway and river diversion works).
3. Borrow pits for embankment material.
4. Borrow pits for concrete material.
5. Proposed camp site.

V. Photographs.

1. Dam site (several from different locations).
2. Rock formation, if any.
3. Construction camp site.
4. Borrow-pit areas.

VI. Transportation.

1. Distance to nearest railroad station and condition of roadway and bridges.
2. Possibility of railroad to the dam site.

VI. Transportation—Continued.

3. Methods of transportation of borrow; pit materials possible and length of haul.
4. Condition of roads during various seasons of the year.
5. Local rates of haul per ton-mile.

VII. Foundation testing.

1. Log of all test holes.
2. Log of all test pits or drifts.
3. Map of dam site showing all test holes or pits.
4. Depth of excavation normal to slope required in the abutments.
5. Character of foundation rock.
6. Character of rock at spillway site.
7. Foundation testing should be outlined after a tentative location of dam and appurtenant works has been made so that the drilling will yield the most useful information possible.

VIII. Embankment material.

1. Location, length of haul, and extent of supply.
2. Rock for riprap.
3. Rock for embankment.
4. Earth fill and analysis of the same.
5. Gravel fill and analysis of the same.

IX. Concrete materials.

1. Location, length of haul, and yardage of all available sources of supply within any reasonable distance.
2. Rough analysis of pit run (per cent sand, gravel, and cobbles).
3. Rough analysis of sand (passing $\frac{1}{4}$ -inch screen).
4. Rough analysis of gravel (passing 3-inch and retained on a $\frac{1}{4}$ -inch screen).
5. Structural quality as determined by visual inspection.
6. For preliminary tests to determine the relative suitability of various sources of supply, ship 250 pounds of sand and 500 pounds of gravel, as noted above, from each source.
7. For final tests on source of supply to be used for construction, consult the Denver office for desired amounts of sand, gravel, and cobbles.

X. Miscellaneous.

1. Provision for highways, railways, public service lines, etc., disturbed.
2. Requirements for fish ladders and fish screens.
3. Availability of native timber for construction and camp purposes.
4. High-water marks in the vicinity of the dam site.



Irrigated oats, Klamath project, Oreg.-Calif



Irrigation on the Umatilla project, Oreg.

X. Miscellaneous—Continued.

5. Condition of concrete in structures previously made with materials considered for work in question.
6. Availability of electric power for construction.
7. Operation requirements of structure.
8. Required irrigation or power outlets.
9. Estimated cost of clearing dam site.

As a rule each such structure is a study in itself and must be treated as such. For such structures it is generally necessary to make extensive surveys, investigations, and reports before the best design and the probable cost of its construction can be determined.

Every practical effort should be taken to make data for these structures complete and accurate. Every factor affecting the hydraulic or operating requirements, the foundation or climatic conditions to be met, the availability and quality of construction materials, methods of transportation, labor and power supply, and other items affecting unit costs should be exhaustively covered. A variation of 10 cents in the cost per cubic yard of concrete in the Owyhee Dam will mean an increase or decrease in the total cost of about \$50,000.

Data for the design of such structures should be thoroughly accurate and reliable. Inaccurate or unreliable data are worse than useless in that they are misleading. There seems need, however, for impressing on those securing these data the importance of making them complete and exhaustive. Incomplete data when preparing designs may lead to serious difficulties in construction and result in costs exceeding the estimates. Topography should be accurate and of sufficient extent and detail so that the structure and all its appurtenant features can be located to the best advantage and its required dimensions accurately determined. The topography also should be submitted in a form and to a scale suitable for laying out the proposed construction on it. The original field sheets are

best, tracings therefrom are next, and blue prints are poorest owing to shrinkage, folds, and difficulty in copying. Topography laid out by an accurate coordinate system is usually the best and this method should be followed in so far as practicable.

Foundation exploration should be sufficient to develop all the conditions beyond a reasonable doubt so as to be able to forecast the final dimensions of the substructure with reasonable accuracy. Where knowledge of the position of sound bedrock is essential, drill holes should be extended sufficiently into the rock to demonstrate its character and to prove that it is not an isolated boulder or projecting ledge. Representative samples of materials disclosed by test pits should be preserved in suitable containers and diamond-drill cores suitably boxed and stored for future reference. In recording the logs of test or drill holes, effort should be made to avoid designations based on personal judgment. All available construction materials, such as earth, gravel, and rock for embankment construction and sand and gravel for concrete construction, should be investigated exhaustively, both as to quantity and quality, as well as to their cost delivered at the site of the work. The investigation of the quality of all available sources of concrete aggregates is of the utmost importance, and in this exhaustive tests should be made as far in advance of construction as practicable. These tests are usually made by the Bureau of Standards in Denver under the direct supervision of this office. General rules for submitting samples for these tests have not been found satisfactory, and for each case the matter should be taken up in advance with the Denver office. A thorough analysis of transportation facilities and costs is also very important, especially where the work is in isolated places,

which is true of many of the most important structures.

POWER DEVELOPMENTS AND PUMPING PLANTS

A third group of structures that are in some respects in a class by themselves are power-development and pumping plants. For the construction features of these, all the care should be used that is exercised in submitting data mentioned for other structures. In addition, the operating and demand requirements should be especially developed and analyzed. Climatic conditions are also most important. The requirements and conditions surrounding all such plants of any magnitude should, in general, be fully investigated on the ground by some one especially trained in this class of work and preferably the one who prepares the designs.

I. Physical features.

1. Location and name of river or canal.
2. Nearest railroad point.
3. Transportation facilities to site, existing and proposed.

II. Water supply.

1. Record, if available, showing maximum, minimum, and mean discharge for each month.
2. Capacity of reservoir.
3. Prior water rights.

III. Head.

1. Gross static head.
2. Maximum net effective head.
3. Minimum net effective head.
4. Average net effective head.
5. Rating curve of tailrace.

IV. Elevations.

1. Datum of elevations and conversion factor to get U. S. G. S. datum.
2. Elevation of spillway crest.
3. Elevation water surface in fore bay, maximum and minimum.
4. Elevation of water surface in tailrace maximum and minimum.

V. Maps, profiles, photographs, and drawings.

1. Maps and profiles.
 - (a) General map of surrounding territory showing location of site, neighboring towns, roads, railroads, canals, and transmission lines.
 - (b) Contour map of site.
 - (c) Profile of penstock or discharge pipe.
2. Photographs of site and existing structures.
3. Drawings of existing structures at site.

VI. Data for estimates of cost.

1. Kind and location of material for construction, gravel, sand, etc.
2. Local costs of labor, teams, trucks, coal, lumber, and other materials.
3. Local hauling rates.
4. Local rates for power for construction.

SECONDARY PROJECT INVESTIGATION REPORTS

The fourth group consists of the design and estimate features of engineering reports on proposed projects being investigated. In so far as practicable, preliminary designs and estimates should be prepared in the Denver office for the major features and structures to be included in the reports on such projects. The same general rules should be followed in submitting data for the preparation of such designs and estimates as for the prepara-

tion of detail designs for construction. The reports must, however, be finally reviewed for approval and will generally contain many design and estimate features for which preliminary consideration has not been feasible. In order that the reports may be intelligently reviewed in this respect both at the time of approval and at any time thereafter by persons not familiar with all the details and circumstances, they should contain sufficient descriptive matter, typical designs, hydraulic data, canal sections, and analysis of costs in condensed and tabular form to support the conclusions reached and demonstrate that they are based on suitable and adequate construction and dependable cost data.

ESTIMATES AND AUTHORITIES

The fifth and last group consists of estimates and authorities for work. The requirements for these are suitably covered in the regulations of the Manual and by Circular Letters. However, estimates and authorities must be approved in the Denver office and this can not be done intelligently without suitable information on the work involved. Where the work is covered by detail designs prepared in the Denver office or by construction contracts, copies of which are on file in this office, it is a simple matter to refer thereto and check the quantities and cost. Where such data are not available the estimate and authority submitted for approval should be accompanied by such descriptive matter, references, or designs as are necessary to show the need for the work, its conformity with approved programs, the suitability of the proposed construction, and the correctness of the estimated cost.

TIME REQUIRED FOR DESIGNING WORK

Time is an important element in the submission of data for designs and estimates and many difficulties often arise to prevent the work being done as promptly as desired. Ample time should be allowed for the preparation of designs. In stating the time limit within which work is required from the Denver office it is best to give a definite date and, if practicable, support it with the reasons therefor. This will carry much more weight than some such phrase as the much abused "as soon as practicable." It should also be borne in mind that the Denver office always has before it work for several projects with a definitely limited force to handle it. It is therefore generally very difficult to take up designing work immediately upon receipt of the data unless advice regarding it is given in advance. All the time practical should be given so that the work for the bureau as a whole can be arranged to the best advantage.

DENVER OFFICE TO BE INFORMED OF EXPERIENCES

In order that the engineering section of the Denver office may be of the maximum service to the individual project and to the bureau as a whole, it is important that it collect the best information possible on the result of engineering performance related to the work. To this end those in charge of field work should keep this office fully informed regarding the suitability in construction and operation of the designs prepared and any necessary modifications or suggested improvements. In this way all the projects may benefit from the individual experiences on each project.

COOPERATION ESSENTIAL

The important work of this bureau is the individual project and all the functions of the bureau should be operated to promote its ultimate success. The engineering section of the Denver office must do its work with this object constantly in view. To do so it must cooperate with and in return receive the cooperation of the project offices and field forces. The Denver office should avoid an arbitrary attitude or arbitrary methods and should constantly endeavor to render real service to the field forces. Such service can not be given by the engineering section without receiving in turn the cooperation of the field forces in furnishing satisfactory data.

MORE than 50,000 pounds of butterfat were received and handled through the Minni-Cassia Dairyman's Association, Minidoka project, during May, and shipped to the cooperative creamery at Jerome for butter making.

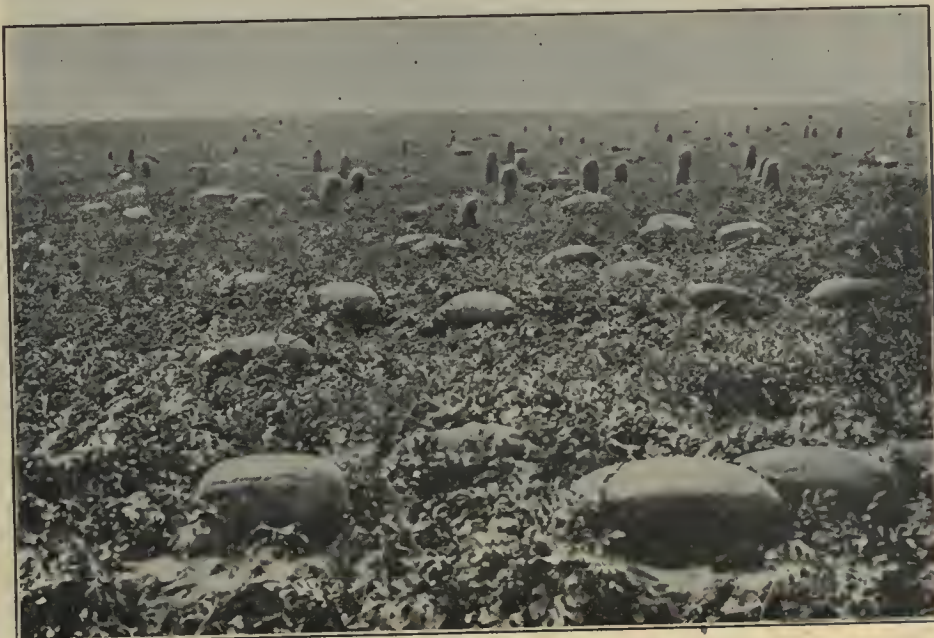
Tule Lake Community Club, Klamath Project, Oregon

The Tule Lake Community Club was organized early this spring and now boasts a membership of about 40, most of whom reside in Siskiyou County, Calif., although Modoc County, Calif., and Klamath County, Oreg., are also represented in the membership. The club has elected three directors, one from each county.

The purpose of the organization is to have somebody authorized to speak for the community as a whole. Various matters needing settlement arise from time to time, such as improvement of roads, combating insect pests, weed control, the distribution of water, and the protection of drains, and it was believed that there should be some organization on the division to mold sentiment and translate it into appropriate action after the community had agreed on a definite plan.

The club also expects to aid its members in buying in carload lots such things as fencing and seed, and may also aid in shipping out surplus products. The club constructed and entered an attractive float at the railroad celebration held in Klamath Falls May 11 and 12, which was awarded a prize of \$25, showing that, even though young in years, this community can accomplish results.

The most important problem before the club at present is to devise some plan of housing school children and maintaining a school in Siskiyou County for the homesteaders there. The present small building, which was constructed by popular subscription with donated work, houses only about 20 children. By fall about 70 children should have suitable accommodations.



Watermelons, Yakima project, Wash.

Project Collections Are Gratifying

THE accompanying table shows that payments of construction and operation and maintenance charges by the Federal irrigation projects will be greater for the fiscal year 1928 than for any other year of record.

Of the 24 operating projects, 22 are on a paying basis, and for the fiscal year 1928 will repay to the reclamation fund more than \$5,000,000. For the 10-month period ending with April these 22 projects reimbursed the fund to the extent of \$3,979,000 of which \$2,769,000 was for construction and \$1,210,000 for operation and maintenance. The estimated additional receipts during May and June will increase the construction payments to \$3,260,000 and the operation and maintenance payments to \$1,748,000, or a total of \$5,008,000. During the fiscal year 1927, which was considered a good year, \$2,140,000 was repaid on construction and \$1,769,000 for operation and maintenance, or a total of less than \$4,000,000.

Including miscellaneous receipts, collections for the fiscal year 1928 will amount to more than \$6,000,000.

THE Idaho Power Co. has installed 30 flood lights having a combined illuminating capacity of 25,000,000 candle-power at Shoshone Falls. By the use of color screens a wonderful effect is produced when the lights are flashed on the great cataract.

Construction, operation, and maintenance collections

State and project	Collections, June 1, 1927, to Apr. 30, 1928	Estimated, May and June	Probable total collections
Arizona: Salt River.....	\$645,959	-----	\$645,959
Arizona-California: Yuma..	613,405	\$25,000	638,405
California: Orland.....	94,460	7,000	101,460
Colorado:			
Grand Valley.....	21,590	63,000	84,590
Uncompahgre.....	155,296	42,300	197,596
Idaho: Minidoka.....	253,773	105,000	358,773
Idaho-Oregon: Boise.....	345,971	10,000	355,971
Montana:			
Huntley.....	18,852	5,000	23,852
Milk River.....	25,876	8,000	33,876
Sun River.....	12,914	3,000	15,914
Montana-North Dakota:			
Lower Yellowstone.....	49,158	32,000	81,158
Nehraska-Wyoming: North Platte.....	136,639	100,000	236,639
Nevada: Newlands.....	76,272	1,000	77,272
New Mexico: Carlshad.....	107,899	2,000	109,899
New Mexico-Texas: Rio Grande.....	445,508	413,000	858,508
Oregon: Umatilla.....	26,594	12,000	38,594
Oregon-California: Klamath.....	91,249	65,000	156,249
South Dakota: Belle Fourche.....	26,734	40,000	66,734
Utah: Strawberry Valley.....	121,336	5,000	126,336
Washington:			
Okanogan.....	39,594	-----	39,594
Yakima.....	624,939	55,000	679,939
Wyoming:			
Riverton.....	721	300	1,021
Shoshone.....	43,548	5,300	48,848
Total.....	3,978,287	998,900	4,976,287

A SHIPMENT of approximately 76,000 pounds of wool from Minidoka project flocks was made by the Minidoka County Wool Pool recently. The wool was purchased by a Boston concern at a price of 33.26 cents a pound.



Irrigation scene in the Southwest

Ice Thrust Damages Magic Reservoir Tower

THE 152-foot concrete gate tower at Magic Reservoir on the Big Wood River, about 25 miles north of Shoshone, Idaho, was broken off and at least partially lifted from its base by the ice sheet on March 8. This condition was first discovered when a large volume of water began flowing from the outlet tunnel, and examination showed that water in the normally dry operating chamber of the tower was standing at the same elevation as the water surface of the reservoir. Outflow from the tunnel measured 370 second-feet. At this time the tower appeared to be plumb. Later it was observed that the tower had assumed a leaning position, being several feet out of vertical at the top. When the leaning was first noticed, the discharge from the tunnel had begun to diminish and as the tower gradually settled back into place the flow of water was reduced to about 15 second-feet. It is therefore believed that the tower was at first lifted vertically from its base by the ice sheet rising with the water in the reservoir, then broke through on the side facing the dam, and finally came back to plumb and almost exactly into place on the base.

The tower is an octagonal structure about 20 feet in diameter with a dividing wall in the center, located at the upstream toe of the earth dam. It springs from a massive base, or spread footing, presumably founded on basaltic rock. Steel was not used in tying the tower to its base and the plane of rupture was at this joint.

On March 13 the leakage was calked off by a diver, who found that very little damage to the gate-control apparatus had resulted. On account of the 50-foot depth of water above the break, the management of the Big Wood Canal Co. considered it advisable to defer permanent repairs until the water in storage can be drawn down by irrigation use. A temporary bulkhead of 12 by 12 inch timbers was fitted to the interior walls of the operating compartment of the tower, being spaced so as to span the crack, and braced to reduce the liability of lateral movement. About September 1 it is planned to construct a heavily reinforced concrete exterior collar around the tower and connecting the broken-off portion with the base.

The Magic Reservoir is owned, operated, and was constructed by the Big Wood Canal Co., and is not a Bureau of Reclamation project.



Reclamation Project Women and Their Interests



Women's Vacation Camp at Guyer Hot Springs, Idaho

THE women interested in home demonstration work on the Minidoka project, Idaho, are planning to attend the second vacation camp at Guyer Hot Springs, Idaho, the last week in July. The camp is attended by the women from the eight central counties of Idaho and is one of the six to be held in the State this summer.

The first camp was held last year. Because of the success of last year's camp another is being planned for this summer. The program which is given at the camp touches the various projects which are given throughout the year in the home demonstration program. The purpose of the camp is threefold—educational, inspirational, and recreational. The morning programs are devoted to educational subjects which are developed by members of the home demonstration staff. The afternoons are given over to recreation. At Guyer Hot Springs there is a swimming pool and many places to hike. Inspirational talks are given in the evening, following vesper services.

Music in the home is being stressed this year. This part of the program will be developed at the various camps by the music department of the University of Idaho and the southern branch.

The following subjects will be those dealing with the educational part of the program:

"The Home Grounds."

"Fashion and Fabric."

"Developing an Appreciation of Art in the Home."

"New Development in Nutrition."

"Developing an Appreciation of Music."

Last year 120 women were in attendance for the full three days of the camp. A larger number is expected this year.

The camp at Guyer this year is under the direction of Miss Mary Van Deusen,

demonstration agent for the southern district.—*Mary E. Van Deusen.*

Project Reservoirs Justly Famed As Excellent Fishing Grounds

NOW that vacation days are near at hand it is only natural that many of us should overhaul the old fishing tackle, engage in long debates on the relative merits of different types of artificial lures, and count the days when

Plants of fish by Federal Bureau of Fisheries in Bureau of Reclamation reservoirs, 1918-1927

State and project	Reservoir	Fish	
		Species	Number
Arizona: Salt River.....	Roosevelt.....	Catfish.....	7,350
		Buffalo fish.....	420
		Crappie.....	3,560
		Yellow perch.....	1,300
		Large-mouth bass.....	5,700
		Rock bass.....	100
		Sunfish.....	30
		Lochleven trout.....	22,500
		Lake trout.....	75,500
		Rainbow trout.....	10,000
		Steelhead trout.....	22,500
		Brook trout.....	67,500
		Rainbow trout.....	17,000
Idaho: Boise.....	Arrowrock.....	Grayling.....	447,000
Montana: Milk River.....	St. Mary Lakes.....	Brook trout.....	278,000
		Black spotted trout.....	112,000
		Rainbow trout.....	22,000
		Brook trout.....	6,700
Montana: Sun River.....	Nelson.....	do.....	22,000
	Willow Creek.....	do.....	37,000
Nebraska-Wyoming: North Platte.....	Pishkun.....	do.....	103,000
Nevada: Newlands.....	Pathfinder.....	Rainbow trout.....	2,500
New Mexico-Texas: Rio Grande.....	Lahontan.....	do.....	5,919
	Elephant Butte.....	Black bass.....	300
		Rock bass.....	6,440
		Sunfish.....	5,025
		Catfish.....	2,080
		Crappie.....	2,025
		Yellow perch.....	400
		Rainbow trout.....	1,800
		Bream.....	11,000
South Dakota: Belle Fourche.....	Belle Fourche.....	Rainbow trout.....	94,000
Utah: Strawberry Valley.....	Strawberry.....	do.....	123,300
		Brook trout.....	16,000
Wyoming: Shoshone.....	Shoshone.....	Black spotted trout.....	6,000
		Rainbow trout.....	
			1,537,949



Guyer Hot Springs, Idaho

we can turn the routine work over to an assistant and snatch a few days of unalloyed pleasure casting or trolling for the big ones.

Many of the reservoirs on the irrigation projects under the Bureau of Reclamation afford excellent opportunities for the followers of Izaak Walton, thanks to the plants of fish made by the Federal Bureau of Fisheries and the State fish hatcheries. The accompanying table shows the plants of fish in our reservoirs made during the past 10 years by the Bureau of Fisheries. In many instances the State fish hatcheries have supplied equally as large or even larger numbers of the finny tribe. At any rate there are enough to furnish sport for all water users and their friends who can break away from the routine of farm work for a few days' vacation.

Legal Notes Relating to the Irrigation Projects

THE following acts were passed by the Seventieth Congress and approved on the dates indicated:

Boulder Dam Investigation

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized and directed to appoint a board of five eminent engineers and geologists, at least one of whom shall be an engineer officer of the Army on the active or retired list, to examine the proposed site of the dam to be constructed under the provisions of H. R. 5773, Seventieth Congress, first session, and review the plans and estimates made therefor, and to advise him prior to December 1, 1928, as to matters affecting the safety, the economic and engineering feasibility, and adequacy of the proposed structure and incidental works, the compensation of said board to be fixed by him for each, respectively, but not to exceed \$50 per day and necessary traveling expenses, including a per diem of not to exceed \$6, in lieu of subsistence, for each member of the board so employed for the time employed and actually engaged upon such work: And provided further, That the work of construction shall not be commenced until plans therefor are approved by said special board of engineers. No authority hereby conferred on the Secretary of the Interior shall be exercised without the President's sanction and approval. The expenses herein authorized shall be paid out of the reclamation fund established by the Act of June 17, 1902.

Approved, May 29, 1928.

Rio Grande Project Time Of Payments Extended

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the

Secretary of the Interior be, and he is hereby, authorized and directed to enter into amended contracts with the Elephant Butte Irrigation District, of New Mexico, and El Paso County Water Improvement District Numbered 1, of Texas, whereby, after the payment of the first four annual installments, as now provided for in existing contracts, upon the construction charge under the Rio Grande Federal irrigation project, New Mexico-Texas, the remaining unpaid construction charge per irrigable acre shall be payable annually in installments of \$3.60.

SEC. 2. These annual payments shall continue until the total construction charge against said districts is paid.

SEC. 3. The existing contracts between the United States and Elephant Butte Irrigation District, of New Mexico, and between the United States and El Paso County Water Improvement District Numbered 1 shall remain unaltered except as herein otherwise directed.

Approved, May 28, 1928.

Okanogan Project Transfer

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized to contract with the Okanogan irrigation district for the transfer of the control of the Okanogan project, in the State of Washington, constructed pursuant to the Act of June 17, 1902 (Thirty-second Statutes at Large, page 388), and Acts amendatory thereof or supplementary thereto, known as the reclamation law, upon the district agreeing to pay to the United States in discharge of all obligations the sum of \$10,000 per annum for the period of thirty-one consecutive years, beginning with the year 1928 such installments to be due on December 1 of each year and bear interest at the rate of 6 per centum per annum after due. Upon such payments being completed, the said Secretary is authorized to convey to the district all the right, title, and interest of the United States in and to said Okanogan project.

SEC. 2. The Secretary is authorized to assign to the district all claims that the United States now holds under contracts with water users and others owning land outside the boundaries of the said district, or owning land within the boundaries of said district but not consenting expressly or impliedly to the modifications in their water-right contracts necessary to conform to the terms of said proposed contract between the United States and the Okanogan irrigation district. During the irrigation season of 1928, prior to the execution of such contract with the Okanogan irrigation district, the district may, at its own expense, operate the canals and other works of the Okanogan project for the delivery of water to the water users thereunder, and during such irrigation season may deliver water regardless of the restrictions now imposed by the reclamation law relating to delinquency in payment of charges.

SEC. 3. The contract between the United States and the said district shall reserve to the United States the power to resume control of said project at any time when necessary to shut off water to enforce payment of the annual installments provided for in the first section hereof.

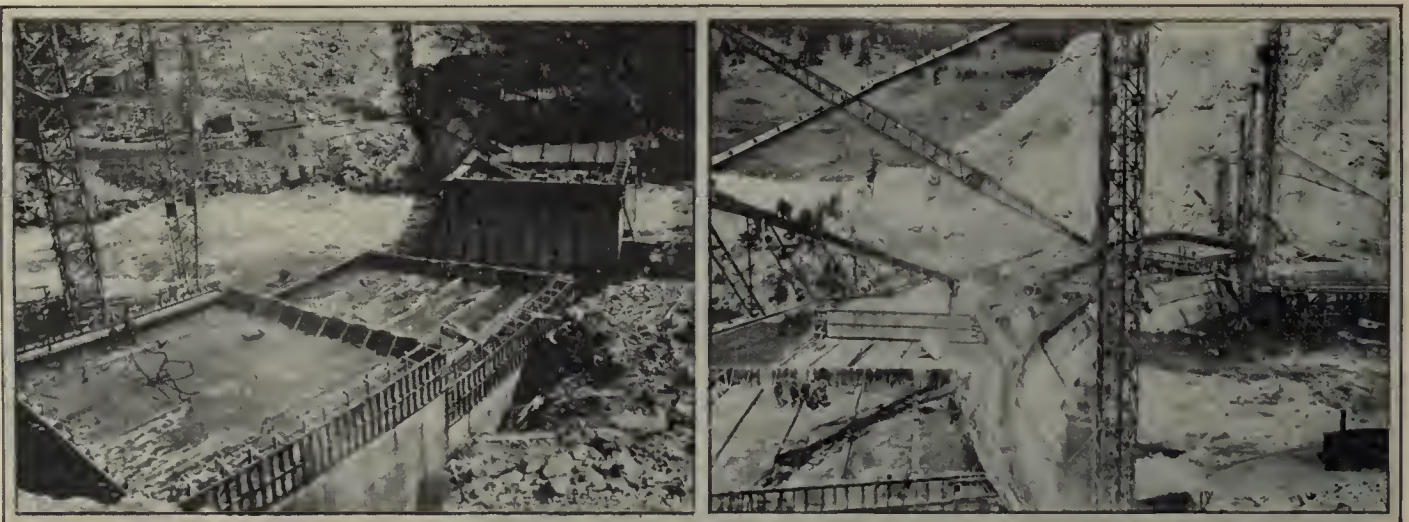
The Secretary of the Interior is directed to resume control and shut off water to enforce payment whenever any such annual installment is not paid on or before March 1 after due.

Approved May 25, 1928.

Second Deficiency Act

Boise project, Idaho: The unexpended balance of the appropriation of \$400,000 for continuation of investigation and construction, Payette division, contained in the Act making appropriations for the Department of the Interior for the fiscal year 1928, shall continue available during the fiscal year 1929.

Carlsbad project, New Mexico: For beginning the enlargement of Avalon Reservoir, fiscal years 1928 and 1929, \$250,000, payable from the reclamation fund.



Construction progress, Gibson dam, Sun River project, Mont

Minidoka project, Idaho: The unexpended balance of the appropriation of \$400,000 for investigation and construction of gravity extension unit contained in the Act making appropriation for the Department of the Interior for the fiscal year 1928 shall continue available during the fiscal year 1929.

Newlands project, Nevada: The unexpended balance of the appropriation of \$50,000 for the survey and examination of water storage reservoir sites on the headwaters of the Truckee River, and for other purposes, contained in the Act making appropriations for the Department of the Interior for the fiscal year 1928, shall continue available during the fiscal year 1929 for the same purposes, including test borings, and shall also be available for the survey and examination of water storage reservoir sites on the Carson River, investigations of dam sites at such storage reservoirs, and estimates of costs, with recommendations in regard thereto.

Colorado River front work and levee system: To reimburse the reclamation fund for the benefit of the Yuma Federal irrigation project in Arizona and California for costs incurred during the period from January 21, 1927, to March 6, 1928, and paid from the reclamation fund, for the operation and maintenance of the Colorado River front work and levee system adjacent to said project, \$72,640: *Provided*, That the appropriation of \$35,000, contained in the Interior Department Appropriation Act for the fiscal year 1927, for the share of the Government of the United States for the costs of operating and maintaining the Colorado River front work and levee system, authorized by the Act of March 3, 1925, and the appropriation of \$35,000, contained in the Interior Department Appropriation Act for the fiscal year 1928, for the same purpose, shall also be available to reimburse the reclamation fund for such costs during such period.

Damage claims: For payment in full settlement of all claims against the Government for flood damages to the owners of certain lands near Hatch and Santa Teresa, New Mexico, fiscal year 1929, \$70,000, payable from the reclamation fund in accordance with section 2 of the Act of February 25, 1927: *Provided*, That in addition to the above amount there shall be available for the same purpose such portion of the appropriation of \$5,000 contained in the Deficiency Act of December 22, 1927, as may not be required to defray the expense of ascertaining the amount of such damages.

Approved May 29, 1928.

Gila River Investigation

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized and empowered to make all necessary surveys and investigations to ascertain the best methods and means of utilizing the waters of the Gila River and its tributaries above the San Carlos Reservoir for irrigation and other purposes in the States of New Mexico and Arizona. The Secretary of the Interior is further authorized and empowered to prepare

plans and make estimates of the cost of constructing dams, canals, and other works necessary for the utilization of such waters.

SEC. 2. That there is hereby authorized to be appropriated for this purpose a sum of not to exceed \$12,500 from any money in the reclamation fund: *Provided, however*, That the appropriation herein authorized shall not be available unless or until contributions of equal amounts shall have been provided from local sources.

Approved, May 25, 1928.

Conservation of Fish

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Department of Commerce be, and it is hereby, authorized to study, investigate and determine the best means and methods of preventing the destruction of fish occasioned by ditches, canals, and other works constructed or maintained by the United States; and for this purpose such sums of money as may be necessary, not exceeding in the aggregate \$25,000 are hereby authorized to be expended out of any money in the Treasury not otherwise appropriated.

Approved, May 1, 1928.

Boot Hill Cemetery

On a small rocky hill near the "rim rock" north of Billings, Mont., is located a graveyard on privately owned land. The single monument was constructed from small water-worn cobblestones gathered on an adjacent hill. It marks the graves of about 22 persons buried here subse-



quently to the Custer massacre, but before the Northern Pacific was built across the western plains, in the early eighties.

The terse inscription on the monument is as follows:

DIED 1877 TO 1882

Upon this rugged hill
The long trail past,
These men of restless will
Find rest at last.

The stream flows on but it matters not
To the sleepers here by the world forgot.
The heroes of many a tale unsung,
They lived and died when the West was young.

Practically all of the occupants of this small cemetery "died with their boots on." Living at a time when personal and property rights were protected by force, it frequently was a case of the "quickest man on the trigger." As the population of the country grew, the Vigilantes were formed as a step toward organized government. These bands were displaced by duly elected peace officers and courts, until at present the legally constituted methods obtain for the enforcement of rights, including those to the use of water for irrigation purposes.—E. E. Roddis, district counsel.

Colonization Department of Southern Pacific Co.

A "department of development and colonization," headed by R. E. Kelly, manager of development, has been organized recently by the Southern Pacific Co. It is stated that the object of the department will be to promote the welfare of agriculture generally in the States served by the railroad. The keynote of the work of the new department is expressed in Mr. Kelly's statement that "the gospel of honest representation to newcomers of the kinds of lands and their possibilities will be absolutely insisted upon."

THE Yakima Creamery Co. dedicated its new \$16,000 creamery on May 26 and announced the immediate construction of a plant to produce powdered milk. Permits have been issued for the construction of one cold-storage warehouse in Yakima to cost \$100,000 and another to cost \$120,000.

MORE than 25 farmers on the North Platte project have signed up for the 400-bushel potato club, which is being sponsored by the University of Nebraska Extension Bureau. Each member of the club raising 400 bushels of potatoes per acre or more this year will receive a medal and a certificate of the accomplishment achieved.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, left Washington on June 19 for Denver for a brief conference on the Budget estimates before leaving on a western trip. He expects to be away for several weeks.

Dr. Hugh A. Brown, Assistant Director of Reclamation Economics, was Acting Commissioner of the Bureau of Reclamation during the latter part of the month in the absence of Commissioner Mead and Assistant Commissioner Dent.

Miss Mae A. Schnurr, secretary to the commissioner, sailed for Europe on the *Olympic* on June 9. She plans to visit England, Ireland, Denmark, Sweden, Holland, Germany, Switzerland, Belgium, and France, returning to the office the latter part of July.

W. F. Kubach, chief accountant, left the Washington office for the field on June 8. At Denver he will confer with the commissioner and the chief engineer concerning estimates for appropriations to be submitted to the Budget. Mr. Kubach will return about August 1.

Howard G. Knutson, senior clerk in the Denver office, who broke his leg last February while skiing on Gennessee Mountain near Denver, has returned to duty.

Col. B. F. Fly left Washington, D. C., on June 3 for his home in Yuma, Ariz., stopping en route for a visit with his sister at Texarkana, Ark. He plans to return to Washington in the fall.

Recent visitors at Echo Dam, Salt Lake Basin project, included Natt McDoygall and R. F. Hoffmark, of A. Guthrie & Co.; W. H. Wattis, of the Utah Construction Co.; J. L. Savage, chief designing engineer, and J. R. Alexander, district counsel, Bureau of Reclamation.

Dr. Scott Ewing, of the Bureau of Standards, visited the Grand Valley project during the month and, in cooperation with the local public-service company, buried samples of metal pipe to determine corrosion in alkali soils.

I. M. Zaki, assistant director of public works, of Egypt, who is in this country studying irrigation and drainage problems, arrived in Denver early in May, after spending some time in the Washington office, and expects to spend several weeks in the Denver office studying organization, manner in which projects are investigated, and plans and estimates of construction, letting of contracts and supervision of construction, water-supply studies, supervision of projects operated by the Government, and designs of dams and other structures already constructed or under construction. He plans to visit projects in the intermountain region and then go south through the Arkansas Valley to study private irrigation projects, thence to the Rio Grande, Salt River, and Yuma projects.

Barry Dibble, formerly electrical engineer in the Denver office and superintendent of the Minidoka project, spent a couple of days recently in the Denver office.

Recent visitors to Stony Gorge Dam, Orland project, included Shizuo Sugimura and Masago Tamachi, Japanese engineers, and F. W. Kerns and Warren Egbert, engineers of San Francisco.

The following representatives of contracting firms have visited the Vale project and examined the proposed tunnel and diversion-dam work on which bids were opened June 9: W. H. Wattis, H. Lawler, and A. E. Paddock, Utah Construction Commission; Harry Morrison and F. T. Crowe, Morrison-Knudsen Co.; Mr. Sullivan, for J. F. Shea; A. Guthrie & Co.; Oro McDermith and Jack Bonney, Derbon Construction Co.; and Claude Fisher.

D. C. Henny, consulting engineer, and Col. G. R. Lukesh were on the Klamath project for three days inspecting Clear Lake and Gerber Dams. Other visitors included L. T. Jessup, associate drainage engineer of the Department of Agriculture, and C. H. Canfield, district engineer of the Geological Survey.

Recent visitors at the Hermiston office of the Hermiston Irrigation District, Umatilla project, were A. J. Wiley, consulting engineer, of Boise, Idaho, and C. L. Tice, of McKay Dam.

H. Kenneth Smith, assistant engineer on the Klamath project, has received a temporary appointment with the State Department as engineer in charge of reconnaissance surveys of storage possibilities on the Rio Grande. During his absence, stream gaging and other hydrographic work will be looked after by Alphonsus L. Crawford.

Porter J. Preston, who was transferred from the Yuma project to succeed J. L. Lytel as superintendent of the Yakima project, has completed his work in Washington, D. C., and arrived on the project at the end of the month, relieving W. L. Rowe, who has been acting superintendent for the past few months.

W. B. Camp, agronomist, United States Department of Agriculture, located at Shafter, Calif., and C. F. Dunshee, attached to the Davis, Calif., Agricultural School of the University of California, were recent visitors on the Orland project.

Harold T. Stearns, of the United States Geological Survey; G. Clyde Baldwin, State deputy commissioner of reclamation; R. E. Shepherd, president of the American Falls Advisory Board; and other representatives of the irrigation interests of Snake River Valley, met recently at the American Falls office to discuss plans for a more comprehensive study of the ground waters of the Snake River Basin.

Dr. J. C. Leonard, chemist for the Idaho State Board of Health, visited the American Falls office early in the month in connection with an inspection of the municipal water supply.

Mark Austin, agriculturist of the Utah-Idaho Sugar Co., spent a day on the Milk River project recently.

D. C. Henny, consulting engineer, spent two days on the Newlands project inspecting Lahontan Dam.

H. C. Neuffer, engineer in charge of designs and surveys at Coolidge Dam, was a Rio Grande project visitor during the month.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. HUBERT WORK, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George O. Kreutzer, Director of Reclamation Economic

W. F. Kuhach, Chief Accountant

C. A. Bisseeil, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C.
A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlshad.....	Carlshad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	E. E. Chahot.....	.....do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	Erle W. Shepard.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Huhbell.....	Virgil E. Huhbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weher.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....	C. C. Cragin.....	.....	.....	.....	.....
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	.....do.....	Do.
.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philehaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gihson Dam.....	Augusta, Mont.....	Ralph Lowry ¹⁴	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Dam site, Elk Creek, Calif.....	H. J. Gault ¹⁵	C. B. Funk.....	.....	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

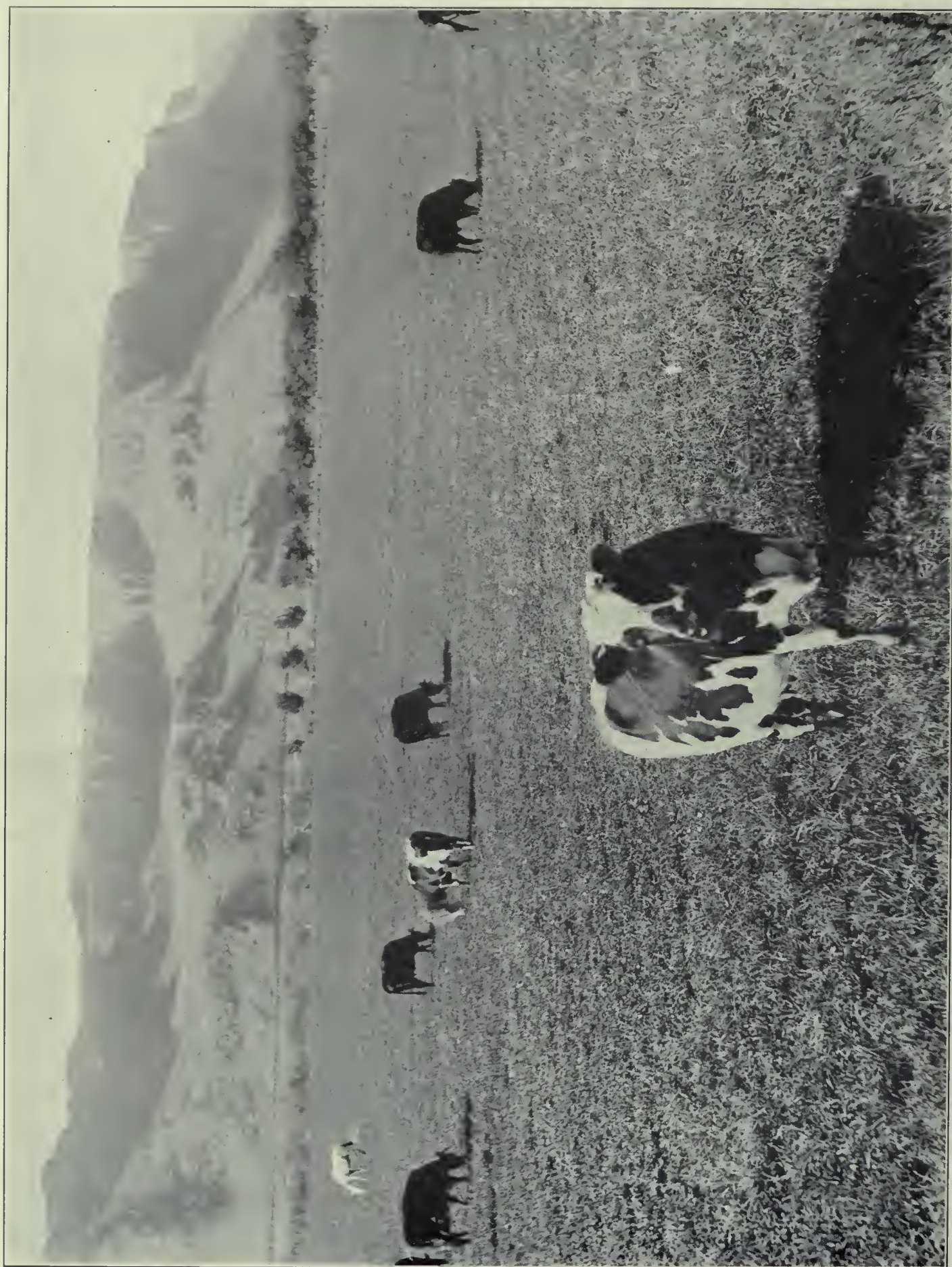
¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Denver, Colo.....	.....	Middle Rio Grande conservancy district.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	.....
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	.....



IN PASTURES GREEN

NEW RECLAMATION ERA

VOL. 19

AUGUST, 1928

NO. 8



THE TRANSFORMATION OF THE DESERT FROM SAGEBRUSH TO ALFALFA



EFFICIENCY OF PERSONNEL

*WE are concerned with the efficiency of our personnel. We can not hope to have the desired degree of efficiency with inadequate compensation. The two are incompatible. In a going business concern the most important requisite to maintain efficiency is an adequately compensated personnel. That is a business asset. I am just as much in favor of adequate compensation as I am opposed to overcompensation. What we are seeking is justice to the employee and justice to the taxpayer. The right principle for fixing compensation has been established. Readjustments may be necessary from time to time to correct inequalities in the salary schedules, but these should not interrupt the present principle nor destroy the uniformity assured by that principle. * * * Now that salaries have been increased, it is the duty of all supervising officers to see that they are earned. * * * Those persons on the pay roll who are not able to earn these high rates of salaries should be replaced by those who are more competent.*

*From the address by President Coolidge at the
Business Meeting of the Government
Washington, D. C.
June 11, 1928*

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

ROY O. WEST
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

August, 1928

No. 8

Interesting High Lights on the Federal Reclamation Projects

CONTRACT has been awarded to the General Construction Co., of Seattle, Wash., for the construction of the Owyhee Dam, Owyhee project, on the company's bid of \$3,198,779.

AT Stony Gorge Dam, Orland project concrete placed to July 1 amounted to 42,125 cubic yards, or about 97.6 per cent of the concrete for the whole structure. The 42-inch needle valves were being installed. The dam should be completed in September, about two months ahead of contract time.

PLANS have been made by local organizations on the Milk River project to publish, at the earliest opportunity, a booklet advertising the project.

THE farmers' cooperative elevator on the Milk River project held its annual meeting recently. About \$90,000 net profit was realized during the past year, resulting in an additional return to members marketing through the organization of 15 cents per bushel for grain handled.

EDUCATIOnAL progress on the Newlands project, Nevada, is indicated by the fact that 20 years ago only three teachers were employed in the Fallon schools. Now there are 19 teachers and an enrollment of 653 pupils.

ACARLOAD of rice was shipped from the Yuma project recently. This crop was grown on salty and alkaline land which is unsuitable for other crops. As rice requires a great deal of water it can be grown successfully while the land is undergoing leaching for salt and alkali, and some unit holders have adopted the policy of planting rice and realizing some returns from the land during the process.

E. M. HAMMOND, farmer and raiser of blooded sheep on the Klamath project, has purchased the champion buck of the annual ram sale held at Davis, Calif., at a price of \$421.

THE Southern Pacific Railroad Co. has announced that it would begin construction promptly of what is known locally as the Modoc Northern Railroad, extending from Klamath Falls, Oreg., in a southeasterly direction to Alturas, Calif., a distance of about 100 miles, and connecting with the Southern Pacific near Fernley, Nev.

ANNOUNCEMENT was made by President Coolidge on July 21, 1928, of the appointment of Hon. Roy O. West, of Illinois, as Secretary of the Interior to succeed Hon. Hubert Work, of Colorado.

ON July 13, 1928, the Salt River project forwarded its check for \$515,699.52, being the balance of the 1921 and 1922 construction charges deferred under section 2 of the act of May 9, 1924, less \$35,595.77 paid November 30, 1920, plus interest at 6 per cent from December 1, 1926, to July 13, 1928, amounting to \$45,593.81.

MORE than 20,000 cubic yards of concrete were placed in the Gibson Dam during the month, bringing the total to 65,400 cubic yards, with 95,000 remaining to be placed.

C. F. GRAFF, of Seattle, Wash., has been awarded the contract on his bid of \$231,947.10 for the construction of Easton diversion dam and part of the main canal, Kittitas division, Yakima project.

ON the Yuma mesa 10 acres were planted to grapefruit during June, which will end the planting until next spring. This makes a total of 115 acres planted this year on unit B lands and 20 acres on the University of Arizona experimental farm adjacent to unit B. The total area in this division now under cultivation is 962 acres, with an additional 42 acres of citrus fruit on the experimental farm.

TWENTY-FIVE additional public land farm units were opened to entry on the Willwood division of the Shoshone project, Wyoming, on July 16, 1928, ex-service men having a preference right of entry until October 18.

OF 12 cow-testing associations of the State of Idaho, including 351 cows, the highest average production of butterfat per cow for the month of May was made by Haven Leigh, of the South Side Minidoka project. From five Holstein cows Mr. Leigh obtained an average of 53.7 pounds of butterfat. For June, high individual records of the Mini-Cassia Cow Testing Association are H. T. Jacobs, of Delco, with a Holstein cow producing 82.5 pounds, and Robert Guardell, of Rupert, with a Holstein producing 69 pounds of butterfat.

THE Farmers Trading Co. has been incorporated at Rupert, taking over the Farmers Bonded Warehouse Co. at Rupert and Burley. The company will specialize in potatoes, but will also handle other farm produce.

THE Derbon Construction Co., of Seattle, has received the contract for the construction of the diversion dam, earthwork, tunnels, and structures, Vale main canal, Vale project, Oregon, on a bid of \$443,421.

Land Settlement an Essential Part of Reclamation

Report by George C. Kreutzer, Director of Reclamation Economics, Bureau of Reclamation, and J. F. Jackson, General Agricultural Agent, Central of Georgia Railway, Members of the Land Settlement Committee of the Reclamation Section of the American Society of Agricultural Engineers

THE purpose of all reclamation is to make homes for worthy people under social and economic conditions where they will be prosperous and contented and repay the cost of the improvement. The solvency of reclamation enterprises depends on the land being promptly settled by good farmers under a program which will bring about early profitable cultivation.

Reclamation may be divided into three operations, as follows:

1. Building or carrying out the actual reclamation work.
2. Subdividing and converting the reclaimed land into productive farms.
3. Colonizing the land, organizing the settlers into social and business groups, and working out and establishing an agricultural program.

The first operation can be carried out by any competent engineering force. The principles involved and methods used are well understood. The most difficult problem confronting reclamation is successful settlement of the project and the development of a sufficiently profitable agriculture to repay the cost of reclamation over a period of years. There can be no successful reclamation without farmers; the character of the farmer and his family and their happiness and contentment and their success finally determine the success of reclamation.

It takes time and money to create profitable farms on reclaimed land. Estimates made on several new Federal reclamation projects by investigators largely drawn from western agricultural colleges show that the cost of developing and equipping an 80-acre farm, exclusive of the cost of reclamation, varies from \$5,000 to \$10,000. Investigation of reclamation in the South shows that the cost of improving and equipping 100 to 120 acres varies in seven States from \$4,500 to \$7,500. This cost was about double the cost of drainage, clearing, and providing roads to each farm.

Few settlers have this amount of capital or credit to complete the development of their farms. Those who have the capital have shown a preference to buy improved farms. They thus avoid pioneering and are assured of an immediate income. Settlers with small capital can not finance the necessary building and land improvements or equip their farms with modern tools and machinery or acquire good livestock. The result is delayed development

and small farm incomes. This causes a default in the payments of reclamation charges. If only settlers who have enough capital to provide these necessities are taken, settlement would be slow, because the number from which they can be drawn is restricted. Experience has repeatedly shown that all new farm-development enterprises must rely on settlers who have small means. Of those who applied for farms from the Bureau of Reclamation in 1927 less than 10 per cent had \$5,000 or more; most of them had capital ranging from \$1,000 to \$3,000. The applications submitted showed they were largely experienced farmers of worthy purposes, yet only a few really had enough money to begin the development of an irrigated farm with assurances of success. There are no existing agencies which will make advances to settlers to bridge the gap between the time the settlers' small capital is expended and complete and profitable farm development is established. He can not secure a real-estate loan because he is buying his farm on time. The title is held by the owner. Chattel loans in small amounts may be secured from banks for periods of 90 days and at the going rate of interest. This rate is usually ruinously high, because reclamation is generally carried out in remote parts of the country where money is scarce.

Investigations have been unable to discover community or State agencies which will undertake the partial development of farms or to provide funds which may be advanced so the settler can complete the development himself. One of the reasons for this is that the reclamation cost is a prior lien; another and perhaps the main reason is that the necessity of providing some improvements on the reclaimed farm before sale and the providing of funds for advances is not yet fully understood. It is essential that such liens be in the nature of a first mortgage or on a parity with the lien for reclamation.

The agency which carries out and finances reclamation work should partially improve farms or make loans to assist settlers to complete the improvement of farms. The loans should extend over a long term and bear a low rate of interest. The loans should be carefully supervised so that the amounts advanced go into the improvements required. In some countries which have made this a part of their reclamation policy, loans are advanced from 60 per cent to 80 per cent

of the value of the permanent improvements and made repayable in 20 to 75 years.

Reclamation liens on unimproved and uncultivated land have been found worthless. They are only worth 100 cents on the dollar when the land is settled and a profitable agriculture is created. When reclamation is carried out by any agency a fund should be created along with the amount required to construct the reclamation works to be used for improving farms and financing settlers. This would create real farm opportunities, assure rapid settlement and farm development, and make project income sufficient to pay the joint obligation of reclamation. Investment bankers and promoters on private enterprises should provide this fund out of the money raised by bond issue and repay the amounts used for advances as they are returned from settlers' contracts. The discrepancy between settlers' capital and the amount required to make farms profitable shows that the advances or preparatory work or both should vary from a few hundred dollars to about \$4,000 per farm with an average of \$2,500 to \$3,000.

If loans are granted, the loaning agency should either own the land or be given a first mortgage over the land and improvements. Owning the land is the more desirable, because the same agency that builds the works and makes advances should colonize the land and make and administer the contracts with settlers. This plan permits the working out of a more efficient subdivision by making farm boundaries fit in with topographic features such as depressions and ridges and with soil types. In making such subdivisions of irrigated land it saves in the cost of laterals, drains, turnouts, flumes, and bridges. It adds to the convenience of irrigation and saves in the use of water. Under drainage developments it saves bridges and permits roads to be located along the ridges.

The land should be sold on long-term amortized payments with a low rate of interest with the privilege of the settlers paying off a portion or all of the balance owing at any time. One authority who owns or controls the land, subdivides and settles it, makes advances to settlers, and carries out the reclamation work can do these things better and cheaper than if several organizations must carry out only

(Continued on page 115)

From Flying to Handling Those That Fly on the Shoshone Project

By L. H. Mitchell, Superintendent

HERMAN F. KRUEGER, one of the settlers on land in the Deaver irrigation district of the Shoshone project, Wyoming, returned from service in the American Air Service in Italy unable to fly longer because of lung trouble, and chose as a location a unit near Deaver, Wyo., in 1920, principally because of climatic conditions.

It was not long before his interest turned to flying again, for he entered the bee business and has built up an apiary of nearly 400 colonies at the present time. He made a statement to me a few days ago that his honey production should now be upwards of 40,000 pounds a year, all graded white and extra white.

DRIVES THE SCHOOL BUS

Mr. Krueger's bees are handled in a home yard and five outyards where he rents ground for them, scattered over a radius of 15 miles. All supers are stored at the home place and all extracting is done at the plant of John Hendricks, near Powell, Wyo. The home storage building enables him to load the empty supers at home and go to any yard or yards, placing them as they are needed. During the school months he finds time to drive a school bus to Garland, Wyo., which is located near the center of his triangle of yards, and then proceeds to the extracting plant or yards, thus getting an income on his way to work. After the bees are packed for the winter and all the honey extracted, the middle of each day is taken up with the assembling of new hives or supers. In the evenings he runs the bus

line again, thus getting paid for returning home. Such a combination of work has enabled him to enter the business much more rapidly, for all of his profits from bees could be reinvested in the business, the bus paying his living expenses.

Value of Livestock and Equipment

The total value of livestock and farming equipment at the beginning of 1928 on the Federal irrigation projects under the Bureau of Reclamation amounted to more than \$36,800,000.

A recent tabulation shows that on January 1, 1928, there were on the Federal irrigation projects 77,842 horses, valued at \$4,027,610; 10,015 mules, valued at \$854,971; 61,823 beef cattle, valued at \$3,154,176; 118,944 dairy cattle, valued at \$8,789,600; 307,398 sheep, valued at \$2,864,960; 112,936 hogs, valued at \$1,111,982; 2,068,812 chickens, turkeys, ducks, and geese, valued at \$2,392,593; 41,118 hives of bees, valued at \$270,325; and 1,352 rabbits, valued at \$2,231. Including the value of purebred and scrub sires of beef and dairy cattle and the value of brood sows, the total livestock value amounted to \$24,011,218; and that of farm equipment to \$12,821,252. This was an increase in the value of livestock and equipment of more than \$4,000,000 over that of the preceding year.

PLENTY OF WORK

To give an idea of the work involved, let us remember that each hive is made up of more than 50 pieces of wood, many of which must be run over the power saw a number of times to cut all grooves, mortices, etc. A conservative estimate of the pieces sawed and assembled for hives and supers is 100,000 and the operations in sawing and assembling would approximate a million. All this has been done without hired help, so naturally everything has been figured to eliminate labor.

In addition to this, Mr. Krueger has found time to place 70 acres of his unit in cultivation, to build a house on it with bath, running water, and sewerage, and to construct all the necessary outbuildings for running a farm. Does not this seem enough to have kept one person busy? And yet he has found time to be interested in community affairs and has served on the water users' board and board of commissioners of the irrigation district for the past five years.

When I asked him what he thought of the Deaver district as a place to settle, he said, "One can find all the work he wants here, and a healthy place to live. That's what any one who settles on a Reclamation project should be looking for. It's what it takes to make a home."

MRS. KRUEGER HELPS

He considers himself rather small fry in the bee business. Says he gets stung so many times in business that there has just got to be something sweet about it, hence the honey. He gives his father and mother much credit for helping develop the ranch and says his wife rates as a first-class bee woman, for she goes with him many times to the yards, taking an active part in the handling of the bees and aiding in the lighter parts of fixture assembling.

Such a business has developed on the project from a start of nothing in a period of seven years and without great indebtedness, for enough honey is in storage to pay all obligations and leave a nice operating balance for next summer.

If you were to ask Mr. Krueger what he thought of the opportunities in this locality, he would tell you that he had nothing for sale, but if he knew where the opportunities were better he would have everything for sale.

NOTE.—Since writing the above article we learn that Mr. Krueger has taken a junior partner into his firm, and best wishes are extended for the success of Herman F. Krueger & Son, beekeepers.

Land Settlement Essential to Reclamation

(Continued from page 114)

certain parts of the program. Under this plan there is no divided authority or duplication of effort.

Successful manufacturing enterprises require skillful management which understands buying raw materials, low cost production methods, and selling the finished product at a profit. Successful farm management is based on the same principles. The farm operator must have experience, industry, and thrift. He must have some knowledge of the science of soils. He must know when and how to plant, fertilize, cultivate, and harvest. He must know something of the care of animals and the control of pests. He must know what to produce before he can sell to advantage. This requires that settlers be selected. There is too much competition in farming for the inexperienced or underfinanced to succeed. New settlers should know the fundamentals of farming and be industrious and thrifty. Settlers with some capital and experience do much better than those who know little of the industry or who have little capital of their own to invest. Every reclamation enterprise should select its settlers on the basis of capital, experience, industry, and character.

Along with this community organization is required. This applies to community buying and selling and the working out of a community program of agriculture. By these means high quality standard products can be produced in large quantity for market. These are all essential parts of reclamation and should be included in any well-planned reclamation program.

Minidoka Gravity Extension Unit Approved by President Coolidge

The Secretary of the Interior concludes that the project is feasible from an engineering and economic standpoint, based on searching investigation, of water supply, engineering features, cost of construction, land prices, and probable cost of development

PRESIDENT Coolidge on July 3, 1928, approved the construction of the gravity extension unit of the Minidoka project, Idaho, as submitted to him in the following letter from the Secretary of the Interior:

THE DEPARTMENT OF THE INTERIOR,
Washington, D. C., July 2, 1928.
The President,
The White House.

MY DEAR MR. PRESIDENT: The time has arrived for final consideration of the construction of the gravity extension unit of the Minidoka reclamation project, in Idaho.

The following preparatory steps have been taken:

1. An act of Congress of January 12, 1927 (44 Stat. 934, 958), appropriated \$400,000 for the investigation and construction of the gravity extension unit of the Minidoka reclamation project, in Idaho. An act of March 7, 1928, Public No. 100, appropriated \$1,075,000 for continuation of construction of this project.

2. The economic investigation and engineering plans provided for in the above appropriation have been completed.

3. Money to pay for increasing the capacity of the first 3½ miles of the main canal has been provided by the parties interested in this increase.

4. Bids for the first section of the canal have been received. The one recommended for approval is below the engineering estimate.

5. An irrigation district has been created which embraces all of the privately owned lands now irrigated, the partly developed land not irrigated, and the public land susceptible of irrigation. This district has entered into a contract with the Government to repay the entire cost of this development in accordance with the terms of the reclamation act within 40 years.

Before contracts for the construction of this development can be let, it is necessary that a finding, required by subsection B, section 4, of the act of December 5, 1924, as follows, be made by the Secretary of the Interior, and that construction be approved by the President as required by the act of June 25, 1910:

That no new project or new division of a project shall be approved for construction or estimates submitted therefor by the Secretary until information in detail shall be secured by him concerning the water supply, the engineering features, the cost of construction, land prices, and the probable cost of development, and he shall have made a finding in writing that it is feasible, that it is adaptable for actual settlement and farm homes, and that it will probably return the cost thereof to the United States.

The engineering and economic investigations necessary to the preparation of a report under subsection B disclosed the following facts. They seem to justify the immediate beginning of this development.

1. It will create a market for 400,000 acre-feet of water out of the now unsold capacity in American Falls reservoir, and will secure for the Government an obligation for the repayment of \$2,000,000 of the construction cost of this storage. Without some such development this unused capacity of the reservoir will bring no return on the construction cost.

2. It will give an ample and an assured water supply to 80,000 acres of land which now have an uncertain and inadequate water supply. Doing this will create a stable and prosperous agricultural community, where now the settlers are menaced by impending failure and have suffered serious financial loss. A full water supply will be provided for 16,000 acres of land, scattered through the settled and cultivated area, now provided with supply canals and lateral ditches, with the land partly leveled. The existence of roads, schools, and social advantages will make this land especially attractive to settlers, and it is believed it will be settled and irrigated as soon as water is available.

3. The canal will command and be able to supply irrigation water by gravity for 20,000 acres of fertile public land. It will be built large enough to supply water to this land. While there may be no immediate return from this expenditure, the cost will be less than half the cost of the storage which is now idle and which this development will bring into use.

ENGINEERING FEATURES

It is proposed to construct a main canal diverting water from Snake River at Milner Dam, 25 miles east of Twin Falls, Idaho, and running northwesterly for a distance of 70 miles to an intersection with a constructed canal now serving lands in the vicinity of Gooding, Idaho. The latter canal is part of a system constructed under the Carey Act 20 years ago for the irrigation by gravity of some 80,000 acres of land with water from Big Wood and Little Wood Rivers, and for which the present water supply has been found uncertain and inadequate. The proposed canal will permit the waters from Big and Little Wood Rivers now being used below its level to be devoted exclusively to the irrigation of 36,000 acres of higher lands, and will so augment the water supply for these higher lands as to permit profitable cultivation. In addition to this indirect irrigation the proposed Government canal would be large enough to irrigate directly 80,000 acres of



An irrigated wheat field on the Shoshone project, Wyoming

land, of which 60,000 acres are now in a position to be reclaimed and cultivated and 20,000 acres of public land, hereinbefore referred to. The expenditure of \$800,000 for laterals for this public land will not be made until settlement is assured.

No diversion dam will be required as the Milner Dam, belonging to the Twin Falls South Side and Twin Falls North Side Canal Cos., elevates the water to the required level. Under arrangements now made this elevation is provided without cost to the Government.

The first $3\frac{1}{2}$ miles of the canal will have a capacity of 2,750 second-feet. Of this, 1,000 second-feet will be used by the North Side Twin Falls Canal Co., which has a canal immediately adjacent of inadequate capacity. This section of the main canal will be in a deep cut and largely rock. Much of the remaining 64 miles of canal is in rocky country with capacities decreasing from 1,600 second-feet to 400 second-feet. The last 3 miles of the canal pass through a basaltic region devoid of soil where a concrete flume 11 feet wide and 7 feet high will be required.

WATER SUPPLY AND DRAINAGE

The water supply will be obtained from Snake River, the natural flow of which in the irrigation season will be fully used, in low years, by rights initiated in advance of this project. The project lands will therefore have to depend on water stored in the American Falls Reservoir. Four hundred thousand acre-feet, or 5 acre-feet of water for each acre of land, have been set aside for this purpose. The storable winter flow, together with flood waters storable in most years and in part carried over from year to year, will cause the reservoir to fill, except in the very dry years. Irrigation shortages will be infrequent and of minor extent.

Only minor drainage works are likely to be required.

Construction cost

Main canal.....	\$3, 800, 000
Miscellaneous minor features.....	400, 000
Total.....	4, 200, 000

To this will have to be added at a later date \$800,000 for the construction of laterals to irrigate the public land which can be supplied by gravity from this canal. Storage in American Falls Reservoir at a cost of \$2,000,000 has already been provided.

CROPS

On the partially irrigated lands to be included in the project and on other lands in this locality, the prevailing crops are alfalfa, sugar beets, corn and grain, with

an estimated average annual crop production under present conditions of \$35 per acre. All of the lands lie within reasonable distances of the main and branch lines of the Union Pacific Railway system. Over 400,000 acres of irrigated land are now successfully cultivated in the immediate vicinity.

LAND PRICES

Under the reclamation laws no more than 160 acres of patented land in single ownership can receive a Government water supply, such excess areas in private ownership being denominated "excess lands." The excess lands of this project have been appraised by a competent board. The contract with the district and contracts with owners of excess lands require that excess lands be disposed of at or below the appraised valuations. Settlers who are allotted public land will be required to have some capital and farming experience. Application of these principles to this project will tend to eliminate some of the obstacles to farm development of the past.

The lands now under irrigation are fairly well improved and are growing alfalfa, clover, small grains, tame irrigated pastures, and potatoes. High-priced crops are not extensively grown because of a lack of late water. Carey Act construction charges on these lands are fully paid. Operation and maintenance charges are 95 per cent paid. This area is well served by towns, railroads, roads, schools, and churches. Considering the hardships which these people have encountered because of a lack of water, their morale and social conditions are excellent.

About 16,000 acres of new lands are interspersed with the improved and cultivated lands of this district. Lateral ditches to irrigate this land are built, and some of it was prepared for irrigation when it was, through court action, excluded from the district because of an inadequate water supply. With this water supply provided, the location of these lands in a settled community, with part of the improvements made, gives confidence that they will be settled and irrigated within a reasonable time after water is supplied, and that the irrigation charges will be paid within the time limits fixed by the reclamation laws.

The 20,000 acres of public land to be irrigated from this canal are fertile, but are unimproved and only about half the area has topography permitting group settlement and community development. The other half, about 10,000 acres, has an uneven surface with float rock and lava outcrops. Many farm units will be isolated, making road building and lateral construction costly. These units should have from 120 to 160 acres of irrigable land and should be used for sheep and cattle raising or dairying. They will require farmers having local experience. To insure the settlement and development of this public land and the payment of construction charges, roads should be built in advance of settlement and a part of the area in the section having isolated farms should be prepared in advance for irrigation. There is no provision in law at present for doing these things, nor any responsible guaranty that they will be done from local sources. The plans for this canal do not therefore contemplate the construction of laterals for this area



An irrigated potato field, Shoshone project, Wyoming

until settlement is assured. The main canal would be built of ample size to provide water, but the expenditure of \$800,000 for laterals will be withheld until there is satisfactory assurance of a demand for the land.

ADAPTABILITY OF LAND TO SETTLEMENT AND FARM HOMES

The land embraced in the project is of good fertility. Good yields of all crops grown in this locality are assured. With care in the selection of settlers, with farms suitably improved and equipped, success in farming may be anticipated.

PAYMENT OF CHARGES

As before stated, all lands to be benefited by this construction have been organized into the American Falls reservoir district No. 2 and a satisfactory contract has been prepared and voted by the owners of the private land, confirmed by court. It guarantees the repayment of a maximum of \$7,500,000. The benefits of this development have been apportioned to the different classes of land and duly confirmed by court with the new lands assessed to pay \$94 an acre, and the old lands to be provided with a partial water supply at \$51.70 an acre, this representing the cost of lands in the Carey Act both above and below the proposed canal.

Under the contract the district is obligated to repay construction costs on new lands within a period of 40 years

and for the lands having a partial water supply within a period of 20 years. This would make the average annual payments on construction costs for new lands \$12.35 per acre per year and on the lands now irrigated and having a partial supply \$2.60 per acre per year. These costs, together with costs for operation and maintenance of the project system and other district costs, will make an annual water charge of around \$4.50 per acre. This is higher than prevailing charges on projects of similar productiveness after readjustment of repayment contracts under the act of May 25, 1926. In view, however, of precautions being taken to curb land speculation, to obtain qualified settlers, and to create conditions which will hasten and cheapen the improvement of farms, it is believed the charges can be met.

It will be seen that this schedule provides for the return of the cost, not only of the new work to be done but also of storage in American Falls Reservoir

CONTRACT has been awarded for the construction of an addition, costing approximately \$27,000, to the Worden High School Building on the Huntley project.

GOOD progress is being made in interesting settlers from points in Colorado to look over the Lower Yellowstone project. Two farms have already been sold as a result of the work, and several other deals are pending.

which has been provided by the Government at an expense of \$2,000,000, and upon which the United States is now receiving no return and will receive no return until an irrigation system is constructed for the utilization of the stored water. The returns from the 20,000 acres of new land may be somewhat delayed, awaiting settlement, as the repayment does not begin until after the land is entered. As an offset to this, the laterals for the new land, estimated to cost around \$800,000, will not be constructed until prompt settlement and profitable cultivation are assured.

FINDING REGARDING FEASIBILITY OF PROJECT

It is believed that this development will mean a gain in income to the reclamation fund, and that the project is feasible from an engineering and economic standpoint, and I accordingly so find and declare.

In view of the urgent need of an increased water supply for an area of 80,000 acres, and the suitability of the 16,000 acres of new lands for immediate successful settlement, I recommend the approval of the gravity extension unit of the Minidoka project, and the issuance of authority to proceed with its construction.

Very truly yours,

HUBERT WORK.

Approved, July 3, 1928.

CALVIN COOLIDGE,
President.



A truck garden on the Shoshone project, Wyoming

Cooperative Community Poultry Plant, Salt Lake Basin Project

By C. F. Williams, Chief Clerk, Echo Dam, Coalville, Utah

THE following article, written by C. F. Williams, chief clerk, Echo Dam, Salt Lake Basin project, Utah, appeared in a recent issue of the Salt Lake Tribune and was reprinted in the Summit County Bee, of Coalville:

Closing up the first year's business with a net profit of \$550 the Coalville Poultry Products Co. starts the coming year with the construction of an additional 100-foot unit of coop and the securing of 4,500 White Leghorn baby chicks, planning on moving their flock into winter laying quarters in the fall with approximately 3,000 laying hens and pullets.

The local company, pronounced by William Warner, former poultry expert of the Utah Agricultural College, as having one of the most up-to-date poultry plants in the intermountain region, is also declared to be the only strictly community cooperative organization of its kind in the State, the outstanding stock being held by 40 stockholders.

The company, which was organized in March, 1927, is the result of a carefully considered and much debated problem as to what should be done in this locality to replace the economic value of the land that would be lost to agriculture with the construction of Echo Reservoir by the Bureau of Reclamation and the consequent submergence of about 1,900 acres of choice farm land. The matter was presented to the local chamber of commerce, and that body, after making a survey of the situation in company with various experts from the agricultural college and leading agriculturists of the State, decided that the poultry industry offered the best opportunity for intensive work in this respect.

Inspection trips were made to the different poultry centers of the State and after the matter was debated from all angles it was thought that a plant situated near Coalville and accessible to all who desired to visit it should be erected.

From the beginning it was the idea that the plant should be a cooperative community proposition, and with this in mind the company was organized with a capital stock issue of \$10,000, par value \$50 a share, with a 10-share limit to any individual. The community phase of the organization is best shown by the officers chosen. R. T. Carruth, cashier of the First National Bank, was elected president; Lawrence Wright, proprietor of the Twin Pine Dairy, vice president; W. M. Boyden of John Boyden & Son, druggists, secretary-treasurer; P. H. Neeley, attorney and abstractor, and David

Sharp, jr., county agricultural agent, directors. These officers served for the first year and the recent election of officers substituted Mr. Wright as president, Mr. Neeley as vice president, and the election of Dr. F. J. Rees to the board of directors.

As a result of the stock-selling campaign, a total of \$6,300 was subscribed and, with this as a basis, 13 acres of land were purchased on the north edge of Coalville on the Lincoln Highway, and construction work on the plant was started. The initial construction consisted of two units of coop, one 190 feet and one 90 feet in length. Upon the completion of the coops 4,500 day-old White Leghorn chicks were purchased and moved into the plant.

Project Water Supply

The month of June was generally cool and accompanied by excessive precipitation on most of the projects, the exceptions being the Rio Grande, Strawberry Valley, Klamath, Boise, and Orland projects.

On the North Platte project, the precipitation for June was the highest that has been recorded. The excessive rains and cool weather, although generally unfavorable for best crop growth, materially improved conditions on the Okanogan project and so augmented the water supply of this project that the moderate shortage of water anticipated will not materially affect crop production. All other projects will receive an adequate water supply.

From this start the company secured a total of 2,300 laying pullets when the flock was moved into winter quarters, and since November has been gathering in the neighborhood of 1,300 eggs daily, the profit for the year's operations being largely represented by the returns from the four months' active laying period since that time. Some revenue has been derived from the sale of culls from the flock and the disposal of the male birds. Careful records of production are kept and close culling is practiced and, at the present time, the eggs produced are grading from 40 to 50 per cent of New York extras, which means an additional 4 to 5 cents per dozen in the price.

As a result of the success of the first year's operations, it has been decided to enlarge the plant for the coming year, and

to increase the capacity to care for 3,000 chickens.

Plans for the construction of an additional 100-foot unit of coop to join the present 90-foot unit were adopted, and after considering various means of construction, the community spirit of the enterprise seemed best suited by the plan of having the construction work performed by the students of the North Summit High School as a project under their manual-training work. This plan was accordingly adopted and the boys, under the direction of Prof. Arthur Bond, have been engaged for the past month on this work. The company, in return for the work of the students, contemplates the installation of some machinery in the shop department of the high school.

The work of construction on the new unit is now completed and with the arrival of 4,500 day-old chicks recently, the additional quarters are in active use.

The time of one man is devoted entirely to the care of the plant and chickens, and his services are a charge against the operations. The officers' and directors' work is all gratis. The books at the close of the first year's operations showed assets of \$12,420.35, with liabilities represented by the outstanding capital stock, and a note indebtedness of \$2,500. Although the profit for the first year is small, considering the short period when egg production was in progress, the results are held to be extremely gratifying and point the way to a very successful operation in the future.

The local plant has been the incentive for a greatly stimulated interest in the poultry industry throughout the entire length of the Weber Valley, and visitors from this and other parts of the intermountain region are numerous. The local plant, although not so large as many others, has been compared as ranking favorably in all respects with any of its kind, and has been the subject of much favorable comment from all poultry experts who have visited it.

With the added interest now manifested, and the anticipated increase in poultry raising, the local company plans on working to secure the necessary number of chickens in this valley, looking to the establishment of a grading plant here.

A FACTORY is under construction in Sidney, Lower Yellowstone project, to specialize in building farm wagon and truck bodies, particularly those adapted to handling sugar beets.

Why and How Reclamation and Settlement in Switzerland are Subsidized by the Government

By Dr. H. Schildknecht, Switzerland

IN Switzerland reclamation is considered as a matter of public interest and is therefore subsidized by the Government. This has followed after many vain efforts to solve the reclamation problem without public aid.

Switzerland, like many other European countries, imports every year large quantities of agricultural products, a part of which could be produced at home. Therefore it has endeavored to make farming more effective by the use of mechanical equipment and the creation of new farm lands by reclamation. It was believed possible to build up agricultural engineering on a private basis without Government aid, but this failed. Only very small enterprises were undertaken. Some farmers opened a few ditches for drainage or laid some tile lines for that purpose. Larger works were projected, but it was not possible to carry them out because they could not be financed on a sound basis. In reclamation it is necessary that money be obtained for a long period at a low rate of interest. Farmers can not pay a high interest rate and repay the loan in a short period of time and at the same time make a living from their farms. Reclamation is economical, but in comparison with industry only relatively small profits can be withdrawn in the first years.

Therefore, speculation with reclamation, as is done in industry, is not possible.

In Switzerland private money would have been available, but on terms that would have meant failure for the farmer. Because reclamation was desired many people asked the Government to take care of this problem. At the same time very unfavorable changes took place in Swiss agriculture. Farmers left their farms in large numbers and drifted into industry, resulting in a gradual depopulation mainly of the mountain valleys of the Alps where farming conditions are very unfavorable. This increased the menace of unemployment in industry. The jobless masses in all European countries constitute a dangerous problem and efforts are being made to overcome this menace.

FINANCIAL AID THE SOLUTION

The Government in Switzerland therefore looked for means to keep the farmers on the land. They gave subsidies, mainly by paying a large part of the cost of improvements on farms and the reclamation of private land.

By subsidizing reclamation another public interest was supported at the same time. Switzerland is geographically in such a position that it depends on other countries for the importation of agricul-

tural products. During the World War the wisdom of the reclamation policy of the Swiss Government was clearly seen since a considerable part of the food supply was grown on areas which had been reclaimed by Government aid.

There is another reason why Government aid in reclamation is regarded as a just system in Switzerland. Reclamation work in many a large valley has been done not only for the improvement of the land agriculturally but to better hygienic conditions in overflowed areas which resulted in diseases among the inhabitants. In such a case it was believed to be unjust to require the owner of the swamp land to pay the whole cost for an improvement which is of public interest. Furthermore, the Swiss people think public money, which improves the land and makes the country fertile and beautiful is well spent, irrespective of the economic benefits which may result.

RECLAMATION OF PRIVATELY OWNED LAND

As early as 1893 the Swiss Government passed a law for subsidy of reclamation on privately owned lands. By this act the Government and the Cantons (similar to the States in the United States) are subsidizing reclamation up to 80 per cent of the cost. Subsidies are given only after a careful investigation of the physical and economic aspects of the different projects. The projects are established by official reclamation bureaus which have supervision during and after construction. The farmers are compelled to keep the works in good shape so that the public money is spent effectively. The support given is not limited to drainage and irrigation. Land clearing and the construction of agricultural roads are supported in the same way. In the Swiss Alps cableways for the transportation of dairy products, domestic water supplies, and fences are provided through Government subsidies. This policy has naturally increased agricultural engineering activities to a marked extent. Large projects, which cost many millions of dollars, have been constructed.

In 1908 Government subsidy was extended to the reparcelling of private land. In many parts of Switzerland the farmers have their land in many small widely separated plats. They live in villages away from their property, which makes farming hard and uneconomic.



Sugar beets on the Milk River project, Montana; potatoes in the background

The use of farm machinery is not easy and the farmers lose a great deal of time in going from one plat to another. This unfavorable condition is now being adjusted by a complete change in the property holdings, so that a farmer having many plats exchanges them for one where he can farm with greater profit. At present large areas are being reparable. This increases the farm income to a considerable extent, but it would never have been possible without Government aid.

Among the first settlement efforts of the Swiss Government were those in the Alps. The average mountain farmer is poor and lives in a rather primitive dwelling. Dairy farming in the mountains is a very hard job. Because in most cases these mountain farmers were not able to build better houses for themselves, stables for the cattle, and houses for butter and cheese making, because they did not have sufficient money and could not obtain it on reasonable terms, the Government helped out by subsidizing the building of stables and paying a large amount of the cost. In this way a very useful work was done and the position of many a mountain farmer was so improved that he was able to farm with profit and consequently abandoned any thought of leaving his place.

MODEL SETTLEMENTS THROUGH GOVERNMENT AID

Similar observations could be made with respect to large reclaimed areas in the lowlands of Switzerland. It is very often pointed out that reclamation work is successful only when the land is settled and farmed. If the reclaimed land is not put to agricultural use nobody benefits from the reclamation and the money spent is wasted. In Switzerland reclaimed areas have in many cases been too far away from the nearest village to be farmed profitably. The land was sometimes not used at all or farmed very extensively only. The price of reclaimed and unreclaimed land was only slightly different in the above-mentioned case in spite of the fact that large sums were spent to improve the land. Therefore, the Swiss Government realizes that settlement is as important as reclamation. To make the money spent effective the Government subsidized the creation of settlements in sparsely populated reclaimed areas. The aid is considerable, but less than for the reclamation of the land. A large number of such settlements have been built in Switzerland. They are designed as model farms and are furnished with all modern improvements. They help to improve the standard of farming because they serve as examples which other farmers of the community may follow. Only the erection of buildings is subsidized, not farm machinery. Without Government

Cold-Storage Facilities in the Yakima Valley, Washington

MR. ROLFE WHITNALL, of Yakima, Wash., has furnished the following statement concerning cold-storage facilities on the Yakima project and in the Yakima Valley:

With the prospect of a large apple crop in the Northwest this season and a good-sized crop of pears and soft fruit, the producing districts will be in better shape than ever before to take care of their crops and market them in an orderly way. The Yakima Valley has consistently increased its cold-storage facilities for the past 10 years. Even if the 1928 fruit crop should be a record breaker, the valley will have cold storage for half the entire apple crop and precooling capacity for a tremendous quantity of pears. The cold-storage capacity in the Yakima Valley has increased from 2,627 cars in 1919 to more than 9,000 cars this year.

All plants being erected in the Yakima Valley are notable not only for their large

storage capacity, but for the completeness of their mechanical equipment and their ample provision for precooling of pears and other commodities.

More attention than ever before is being given to the arrangement of cold-storage space with reference to the transportation of fruit within the plant, and the planning of the conveyor and elevator system is now regarded as a vital part of the architect's job. In a number of cases where the architect is unfamiliar with operating problems, blue prints of general layout have been furnished to appliance manufacturers and their cooperation obtained in completing the plan even to the locating of all openings. This is done on the principle that the transportation of the fruit through the plant is an important factor in operating costs and efficiency, and the proper location of openings depends largely upon the routing of the transportation system.

aid these settlements would not have succeeded, because, as a rule, the farmers have only a limited amount of money and there is little opportunity to obtain private money at a low rate of interest for a long term of years.

The results of Government aid in reclamation and settlement in Switzerland are so successful that there will be no funda-

mental change in the future policy. By these subsidies it has been possible to reclaim large areas and to secure their settlement in such a way that the farmers have an income and do not go bankrupt. If this problem had been left to private initiative probably little would have been done and where attempted would have created unbearable conditions for the farmers.



Irrigated cantaloupes

Turkey Antitheft Association on the Minidoka Project, Idaho

By E. B. Darlington, Superintendent



Branded turkeys in the Antitheft Association, Minidoka project, Idaho

SERIOUS losses by theft to turkey flocks in southern Idaho have been experienced during recent months, and efforts by the growers to protect their poultry have culminated in the organization of antitheft associations. By an act of the Idaho Legislature in 1927 stealing poultry was made a felony, punishable by a maximum sentence of 10 years in jail or a heavy fine, but it has been found difficult by individuals to secure convictions for turkey stealing, largely because of a lack of means of identifying the birds taken.

On April 18, 1928, a number of Minidoka project turkey growers met at Burley and formed the Cassia County Turkey Antitheft Association for the joint protection of the members from losses by stealing. The methods to be used in combating poultry theft include the adoption of certain specified brands to be used by each individual member of the association; the offering of rewards if necessary for information leading to the arrest of any person stealing poultry from a member of the association; cooperation individually and as a body with the regularly constituted law-enforcement officers; and a requirement upon all members selling poultry not for immediate slaughter to give the buyer a bill of sale and to notify the secretary of the association as to the number and kind sold.

Brands, consisting of some combination of three letters, have been assigned to more than 90 members. These letters are tattooed under the left wing of each bird, where they can not be obliterated, and a record of each individual brand is kept by the sheriff, the county agricultural agent, and the board of directors of the association.

For administrative purposes the county has been divided into five districts, each of which is entitled to one director on the association board. The first district, made up of the communities of Burley, View, Claremont, Unity, Pella, Springdale and Starrs Ferry, is represented by W. O. Thompson, of Burley; second district, including Albion, Declo, and Jackson communities, by Frank G. Butler, Albion; third district, all territory along Raft River and the communities of Malta,

Yakima Cherry Crop Breaks All Records

A recent issue of the Yakima Daily Republic states that cherries continued to roll into the markets from all over the Yakima Valley and were proving the early predictions that the valley would harvest a record crop this year. Comparative figures of the cherries moved from the valley in the past nine years indicate that the 1928 crop was the largest ever recorded.

In 1919 there were 75 cars shipped from the valley valued at \$150,000. This had increased in 1923 to 240 cars valued at \$544,320. The 1928 crop surpassed that of any of the preceding years with an estimated shipment of more than 300 cars. None of the growers, buyers, and shipping officials would venture to estimate the total returns from the crop.

Warehouses in Yakima were in full swing handling the crop, and one large packing plant was running at full cherry season capacity with 250 employees engaged in turning out between 60,000 and 70,000 cans of cherries per day.

Idahome, Yale, Heglar, Sublett, Naf, Bridge, Strevell, and Standrod, by Arthur Pierce; fourth district, the Almo and Elba localities, by Asel Lowe; and fifth district, embracing Oakley, Basin, Boulder, Moulton, Churchill, and Golden Valley, by Owen Tolman, of Oakley. The present officers are Frank G. Butler, president; County Agent W. W. Palmer, secretary and treasurer. Sheriff P. D. Pace is ex officio a member of the executive council.

A similar organization was formed recently in Minidoka County, which embraces that part of the Minidoka project lying north of Snake River. Officers have not yet been chosen for the new association, but four zones have been established and demonstrations of tattooing are being made by the county agent.

It is the duty of each member of these associations to report any case of theft in his locality; to observe and report any suspicious character, automobiles, or unusual circumstances; and to assist the executive council and law enforcement officers in the apprehension of criminals. It is believed that these organized protective measures will have a marked restraining influence on poultry thievery.

The raising of turkeys and other poultry has become an important activity on the Minidoka project and elsewhere in southern Idaho, where conditions appear to be especially favorable for the business. The following extract is taken from Extension Bulletin No. 67, University of Idaho College of Agriculture:

IDAHO CONDITIONS FAVORABLE FOR TURKEYS

Idaho has every natural advantage for turkey growing. The extent to which the industry may be developed in the State is limited only by location and by the inclination and ability of the persons interested. In southern Idaho the land is gravelly in character. There are wide expanses of range; feed is abundant; the growing season is long; spring comes early, usually is dry and there is an abundance of sunshine. Southern Idaho is favored with an unusually early hatching season for turkeys, an advantage when compared with many other sections where turkeys are grown.

Idaho turkeys are superior in quality. No other section produces finer quality and there are few that grow as fine. The national crop may be large at times, but it seems probable that Idaho quality always will bring a premium. Low-grade stock is always a drag on the market and off-grade Idaho turkeys are probably no better than the off-grade stock of any other section. The problem of Idaho turkey growers, therefore, is to grow the quality stock that the State is capable of producing.

Engineers and Geologists Designated to Study Boulder Canyon Development

THE Secretary of the Interior has announced the selection of five men, three engineers and two geologists, to whom membership on the commission to study Boulder Canyon and Black Canyon on the Colorado River authorized by the recent Congress, has been offered. These five names are as follows: Maj. Gen. William L. Sibert, United States Army, retired; D. W. Mead, engineer, Madison, Wis.; Robert Ridgeway, engineer, of New York; Charles P. Berkey, geologist, of New York; and W. J. Mead, geologist, of Madison, Wis.

The Secretary addressed the following letter to each of the men to whom invitations were issued:

Pursuant to resolution of Congress and with the approval of the President, I am asking you to serve as one of a commission of five—three engineers and two geologists—to make a study of the site for a storage reservoir on the Colorado River, either in the Boulder Canyon or the Black Canyon.

You have been selected because of your eminence in your profession and for the reason that you have not been connected with the area to be studied either through personal interest, residence, or previous intimate knowledge of the project.

Compensation is limited by the resolution to \$50 per day and expenses. The project being of the greatest importance and the largest heretofore undertaken, I sincerely hope you may consent to assist us, and that you will be available for service at a very early date, as under the law the report must be submitted before December 1, 1928.

General Sibert is a retired Army engineer of long and distinguished service. As a young man he had a long career in river and harbor work. He built the great Gatun Locks and Dam at Panama and the breakwater at Colon Harbor. He was chairman of the board of engineers for the study of flood prevention in China. He commanded a division in France during the World War and returned to America to organize the Chemical Warfare Service. He retired from active Army service in 1920. Since 1924 he has been chairman and chief engineer of the Alabama State Docks Commission.

Robert Ridgeway is chief engineer for the New York subways, and is a past president of the American Society of Civil Engineers. He had to do with the building of the New York Aqueduct and storage dams, was in charge of the construction of the South Ferry Loop and the tunnels under the East River and the Brooklyn subways. He was engineer for the Catskill Aqueduct. He has been

engineer for the transit commission and adviser in such matters to the city of Chicago. He is now chief engineer of the board of transportation for the city of New York.

Daniel Webster Mead is a native of New York and a graduate of Cornell. As a young man he worked for the United States Geological Survey, became city engineer of Rockford, Ill., and in 1904 became professor of hydraulic engineering at the University of Wisconsin, which position he still holds. As consulting engineer he has built numerous large hydraulic power plants and municipal water works for various municipalities.

Warren Judson Mead is a geologist at the University of Wisconsin. Though but 48 years of age he has been a member of the faculty of the University of Wisconsin since 1906. He has long had a con-

sulting practice in economic and engineering geology.

Charles P. Berkey has been professor of geology at Columbia University since 1903. He was geologist for the New York State Board of Water Supply on the Catskill Aqueduct and geologist of the third Asiatic expedition of the American Museum of Natural History. He has had many years of service as consultant in the application of geology to engineering undertakings.

The congressional joint resolution which provided for the appointment of this commission said that—

The Secretary of the Interior is hereby authorized and directed to appoint a board of five eminent engineers and geologists, at least one of whom shall be an engineer officer of the Army on the active or retired list, to examine the proposed site of the dam, * * * and review the plans and estimates made therefor, and to advise him prior to December 1, 1928, as to matters affecting the safety, the economic and engineering feasibility, and adequacy of the proposed structure and incidental works. * * * That the work of construction shall not be commenced until plans therefor are approved by said special board of engineers

Production of High-Grade Alfalfa

PURITY, a high percentage of leaves, clinging foliage, green color, and pliable stems are the essential characters of high-grade alfalfa. The experience of Federal hay inspectors is that the most common causes of low-grade alfalfa are meadows with thin stands, foreign material in the form of partly decayed rakings, weather damage, overripeness at time of cutting, overdrying, baling undercured hay, stacking distinctly undercured hay, and baling during very hot, dry, or windy weather.

In most instances alfalfa intended for market should be cut when one-tenth to one-fourth in bloom, or when new growth starts from the crowns irrespective of the bloom. There will be little, if any, increase of tonnage gained by allowing the crop to stand longer. At this stage of maturity the leaves usually constitute anywhere from 45 per cent to 55 per cent of the total weight of the plants, and the stems have not become objectionably hard and woody. The grade of U. S. No. 1 alfalfa can be attained in practically all alfalfa districts of the United States when crops are cut at this stage of maturity, providing the hay is properly cured and baled and not subjected to much damage from the elements.

Essential points in preserving leafiness and color and preventing overdrying are (1) to facilitate rapid evaporation of a large part of the moisture in the newly mown hay by exposing it to the sun and

wind in the swath where the rate of evaporation is faster than in the windrow, bunch, or cock, and (2) to perform the operations of raking and windrowing while the hay is tough and the leaves are not easily shattered.

The side delivery rake is specially adapted to making windrows of wilted and tough alfalfa that will aerate and cure uniformly with the minimum loss of leaves and color. Average crops of alfalfa hay wilted in the swath will cure almost as quickly in side-delivery rake windrows as though fully cured in the swath and the grade of the hay is much superior. The side-delivery rake is an essential machine in the production of high-grade alfalfa.

Baling direct from the windrow is practiced in many areas, but the chief difficulty encountered in producing high-grade alfalfa by this method is that of getting the hay to the baler in the ideal condition for baling. The condition of the hay at time of baling may be controlled in part by regulating the quantity of hay cut down and windrowed according to the capacity of the press and by drawing in the hay methodically from the field according to the extent of the curing in the swath and windrow. Some of the highest grade alfalfa comes from districts where the hay is put up in large stacks with sleds and a derrick and then allowed to sweat prior to baling.



Reclamation Project Women and Their Interests



Planning for Next Year's Garden

PLANNING the garden is usually a matter for early spring. Frequently it might better be done the previous summer. Often in the fruit or vegetable garden there come times when only a small supply of vegetables is available. At the same time neighbors who planted different varieties or planted at different times will be enjoying the benefits of the garden and a succession of its products. At that time it is possible to take note of present deficiencies and to prepare to remedy them the following year. A sheet of paper for preservation of summer resolutions will prove helpful when the early gardening period returns again.

Also it is well to observe effective groupings of perennials and annuals in neighboring gardens with a view to rearrangement, transplanting, or sowing of seeds to obtain the most beautiful arrangements of the gardens.

In many sections of the country the autumn offers the best opportunity for planting new shrubs and trees. Plans should be made to fit these with those already placed and with prospective plantings. For best results in gardening and landscaping, plans should be laid well in advance and adhered to from year to year.

Clothes Moths

Clothes moths are the greatest offenders among fabric pests. The common clothes moths are usually seen flying in darkened corners and just beyond the range of the brightest rays of the lamp. They prefer darkness. They are frightened when clothing and other objects are suddenly moved, and are then seen running rapidly or flying to conceal themselves in the creases of clothing, cracks, or other dark places.

Complete elimination of clothes moths from dwellings and other buildings is difficult. These insects breed not only in wearing apparel but in such articles as carpets, rugs, piano felts, and upholstered furniture.

While moths may be on the wing during almost any month they are present in greatest abundance the country over from May to July and during September and October.

Constant watchfulness must be the watchword for successful control. No



A well-planned garden on one of the reclamation projects

treatment known to kill clothes moths already in fabrics will have any lasting effect in keeping other clothes moths from infesting the fabrics later if they are left exposed.

Too much emphasis can not be placed on the value of frequent brushing, beating, sunning, and cleaning of articles subject to the attack of clothes moths. Particular attention should be given to crevices, seams, and pockets. Sunning is a valuable aid in the control of moths. If clothing is thoroughly brushed every two weeks it is doubtful if moths can affect it seriously. In articles laid away moths are much more likely to concentrate upon soiled spots if these have not been removed.

Clothes moths do not eat into paper to reach clothing. For this reason, if woollens and other fabrics subject to moth attack are cleaned and freed from moths by any of the methods mentioned above, they will remain safe if wrapped at once and tightly in several thicknesses of firm wrapping paper or in newspapers. After clothing has been made into bundles, these may be left exposed in garrets or on store-room shelves without danger from without.

Dressing the Little Girl

Many mothers have the mistaken idea that children's clothes, in order to be

attractive, must be elaborately trimmed. Such trimming detracts from the child and is likely to make her conscious of herself and her clothes. The most effective and satisfying designs are the most simple. They are easily made and laundered, are comfortable to wear, and enable the child to dress and care for herself and so develop independence. If becoming colors and suitable fabrics are chosen, these simple designs are right for any occasion.

For children's wear, especially for dress up, dotted swiss is a very serviceable fabric. It is dainty and cool, easy to make, and launders well. Cotton voile is also good.

Raglan sleeves on a child's dress are more comfortable than either the set-in or the kimono sleeve. They are more easily made than set-in sleeves, they require no fitting and they allow room for growth without making the dress look too broad across the shoulders.

Nice color combinations, good workmanship, simple and suitable lines for the figure, and appropriate materials all go to make the little girl well dressed. She should be allowed to choose materials for her dresses and be trained to think of the types of clothes suited to various occasions. Her interest in colors and materials will thus be stimulated and she will come to appreciate good design and workmanship.

The Black Canyon Diversion Dam, Boise Project, Idaho

By Ivan E. Houk, Research Engineer, Denver Office, Bureau of Reclamation

THE construction of the Black Canyon Dam on the Boise project, Idaho, in 1923 and 1924 provides for diverting water to 22,000 acres of developed land in the Emmett irrigation district near the town of Emmett, Idaho. It also provides for possible future diversions to 56,000 acres of irrigable land in the Payette division of the Boise project, a proposed extension located in the valleys of Boise and Payette Rivers, approximately 30 miles northwest of Boise. Although the need for the dam was not urgent so far as the development of the Payette division was concerned, it was urgent as regards the interest of the Emmett irrigation district, since this district was not financially able to maintain longer the 16 miles of main canal through the canyon which had been supplying its irrigated lands. The Emmett irrigation district contracted to pay the entire cost of the dam, half of which is to be credited when the Payette division, also called the Black Canyon project, is developed.

The Black Canyon Dam is located at the mouth of the Payette River Canyon, about 7 miles above Emmett, where the valley begins to widen out into sloping land suitable for irrigation. Only half a mile of diversion canal on either side of the river is necessary before actual distribution of irrigation water is possible by the installation of farm tap boxes. The dam raises the water surface 90.5 feet above low water stage, to a surface elevation of 2,497, the maximum elevation permissible because of the location of a branch of the Oregon Short Line Railroad along the south bank of the river above the dam. This elevation will permit direct diversion of water into the proposed Black Canyon Canal on the south side of the river, but requires pumping against a head of 25 feet in order to reach the Emmett irrigation district canal on the north side of the river. Two vertical pumping units of 300 second-feet combined capacity, each unit consisting of a hydraulic turbine and screw pump keyed to a common shaft, constitute the pumping equipment. A power plant has been built since the dam was completed and electric power is now being generated and sold to the Gem irrigation district and the Idaho Power Co. Power equipment consists of two 5,000 Kv-a. generators direct connected to 6,000 horsepower, vertical-shaft, hydraulic turbines.

DESIGN OF DAM

The dam is a concrete gravity structure, 1,134 feet long and 184 feet high, consisting of an overflow section at the river

channel and abutment sections on the sides. Both abutment sections are straight; but the overflow section is made up of three straight sections intersecting with angles of 6 degrees and 50 minutes at the two central piers and meeting the abutment sections at angles of 3 degrees and 25 minutes, thus providing a slight amount of arch effect. The accompanying cut shows a plan, elevation, and typical cross sections of the structure.

In the deepest part of the river channel, where it was necessary to excavate to a depth of 90 feet below low-water surface in order to secure a suitable foundation, the spillway section has a base width of 130 feet, an upstream slope of 0.4 foot horizontally to 1 foot vertically, from bedrock to elevation 2,422.5, and a downstream slope of 0.5 foot horizontally to 1 foot vertically, terminating in a curve with a 60-foot radius in the upper 21 feet. Above elevation 2,422.5 at the upstream side the dam rises vertically to elevation 2,450 and is then provided with a 10-foot overhang so as to obtain sufficient width of crest to permit the installation of drum gates. Training walls separate the spillway section from the abutment sections and keep the overflow confined to the river channel.

The overflow section has a total length of 218 feet between training walls and is provided with contraction joints at 73-foot intervals. The total length of 218 feet is reduced to a net spillway crest of 192 feet by piers separating the crest into three 64-foot lengths. These three lengths are fitted with automatic steel drum gates which raise or lower to accommodate changing river stages. When entirely lowered a flood of 40,000 second-feet can be discharged with a reservoir water surface 3 feet below the tops of the adjoining abutment sections and 7 feet below the tops of the spillway piers. Two 5-foot by 5-foot sluice gates, operated by oil cylinders, with sills at elevation from 2,409.3, control the flow through two 5-foot diameter sluiceways which are used to sluice sand and silt from the upstream side of the dam. Three galleries were constructed in the spillway section; a drainage gallery with floor at elevation 2,420.3, which also provides access to the sluice gate operating machinery; a drum gate operating gallery with floor at elevation 2,456; and a drum gate discharge gallery with floor at elevation 2,448.

The south abutment section has a length of 195 feet, a top width of 10 feet, a vertical upstream face, and a $\frac{2}{3}$ to 1 downstream slope. Contraction joints separate this abutment into three 50-foot

sections and a headworks section. The headworks section, which is located at the south end and which is equipped with two radial gates 14 feet long and 10.25 feet high, provides for a possible future diversion of 1,000 second-feet into the proposed Black Canyon Canal. One of the radial gates is now being used to admit flow to a 45-inch wood-stave pipe serving the Emmett irrigation district lands on the south side of the river.

The north abutment, which has the same cross section as the south abutment, has a total length of 590 feet and is divided by contraction joints into 12 sections. In the section adjacent to the spillway, outlets are provided for the two pumping unit penstocks and the two power penstocks. These four openings have their sills at elevation 2,468, only 29 feet below high-water level, thus insuring relatively clear water for the turbines. A concrete floor and buttresses cantilevered out from the upstream face provide trash-rack supports in front of the penstocks. One of the unusual features in the design of the dam is that the 7-foot discharge pipe from the pumping units enters the dam near the ground level, rises to near the top of the dam, and then traverses the entire length of the north abutment to the north side canal. An adit at the level of the pump-house floor connects with the drainage gallery of the spillway section and a shaft with stairway connects the drainage gallery with the drum gate operating gallery.

FOUNDATION CONDITIONS

The dam is built on an excellent solid-rock foundation throughout its entire length. The deeper parts of the spillway section are built on the Colorado shale formation and the remainder of the dam is built on a hard, dense basalt ridge. The excavated surfaces of both formations were extremely irregular so that many natural keyways were provided between the concrete and the rock.

Two rows of grout holes were drilled along the upstream edge of the base under the spillway section and under a part of the north abutment section, the rows being located 5 feet apart and the holes 10 feet apart in each row and staggered. Under the remaining parts of the abutment sections grout holes were located in one row and were spaced at 5-foot intervals. Holes were drilled to depths equal to one-third the height of the dam, but not exceeding a maximum of 25 feet, and were fitted with 8-foot lengths of wrought-iron pipe for grouting connections. After the concrete in the dam had been placed

to a minimum depth of 6 feet over the base the holes were thoroughly grouted under a pressure of 100 pounds per square inch. A few holes took from 10 to 20 sacks of cement, but the average for the 201 holes drilled and grouted was only 1.53 sacks.

After the grouting was completed a row of drain holes, 8 feet downstream from the second row of grout holes, was drilled at 10-foot centers to depths 5 feet less than the grout holes. These were fitted with 4-inch, sheet-metal, slip-joint pipes, connecting with a longitudinal drain, which, in turn, connects with cross drains leading to the downstream face of the dam. In the abutment sections the longitudinal and cross drains consist of 6-inch vitrified sewer pipe with cemented joints, cross drains being spaced 48 feet apart. In the spillway section the 4-inch pipes were run through the dam to a 10-inch, slip-joint, longitudinal drain, placed at elevation 2,407, vertically under the upstream side of the drainage galley. Vertical 4-inch, slip-joint pipes, connected to the 10-inch longitudinal pipe, drain the gallery above, and a 12-inch outlet drain conducts all drainage to the downstream face of the dam.

At times when the main outlet for the spillway section drainage system could be observed, there was a 4-inch depth of water pouring out of the 12-inch pipe. On May 22, 1924, the total flow of the drains amounted to 0.46 gallon per minute at the south canal headworks, 8 gallons per minute at the south abutment outlet, and 33.84 gallons per minute at the north abutment section.

CONSTRUCTION OPERATIONS

The dam was built by force account, under the supervision of Walter Ward, construction engineer. Work was started in the fall of 1922 and the last concrete was poured on June 18, 1924. In order to avoid delays due to floods the abutment sections were built first and work on the spillway section was postponed until after the 1923 floods had passed. Thus a full year was available for the more difficult construction. A temporary diversion channel, with a capacity of 4,000 second-feet, was built along the foot of the bluff at the south side of the river to carry the river flow during the construction of the spillway section. This channel was carried through the dam in two 10 by 14 feet concrete culverts which were plugged with concrete after the dam was finished. Gravel cofferdams, made unusually watertight by clay filling on the water sides, were built across the river at the ends of the diversion channel.

The principal construction equipment consisted of one 10-ton cableway 1,440 feet long, two 10-ton stiff-leg derricks

with 80-foot booms, four drag lines, seven locomotives, twenty-two 4-yard dump cars, and two derrick hoists. A fixed tower 80 feet high supported the 2¼-inch track cable at the north end of the cableway; a movable tower 67 feet high, with a travel of 240 feet, supported the south end. The movable tower was supported by railway car wheels running on five lines of 80-pound rails. A 3-drum hoist with a 300-horsepower motor operated the cableway proper and a single drum hoist with a 60-horsepower motor operated the movable tower.

The cableway was the most useful and satisfactory piece of equipment in the entire plant. It handled considerable of the excavation for the dam foundation, all the concrete for the north and south abutments, and placed the sluice gates and drum gates. It was also used in unloading and transporting the pumping units, cement, reinforcing steel, steel rails, lumber, forms, etc.

Excavation for the abutments consisted largely of stripping a shallow covering of soil and picking out soft seams and crevices in the rock, except for one hole about 40 feet deep and 120 feet long near the north end of the dam. The stripping was done by a hydraulic giant supplied with water by a 5-inch, two-stage, centrifugal pump. Water under high pressure was the only thing that would successfully and economically clean the very rough basalt surface. The deep hole at the north end of the dam was excavated by hand and the muck removed by the cableway. River excavation was handled by dragline, stiff-leg derricks, and 4-yard dump cars running on trestles built along the sides of the river. The drag lines placed the material directly in the dump cars, or in skips which were handled by the derricks. The cableway could not be used for as much excavation as was desirable because only limited dumping space was available within the range of its travel.

A concrete mix of 1 part cement, 3 parts sand, 3.9 parts gravel, and 3.4 parts cobble, containing 3.5 sacks of cement per cubic yard, was used in the main part of the dam, these proportions being decided upon after elaborate tests had been made in cooperation with the Bureau of Standards. Where extra strength was required, as in thin reinforced concrete walls, cobbles were omitted and a mix of 1:2½:5 was used. Aggregates were excavated by drag line from river bars ¾ to 1½ miles above the dam site, loaded on dump cars, and hauled to the gravel and screening plant or to a storage pile from which they could be obtained when the river was in flood. Two sets of reusable panel forms were used throughout the work, the bottom forms being removed,

raised, and set in place on top of the others while the concrete in the last pour was curing.

COST RECORDS

Accurate records of cost of all parts of the construction operations were maintained throughout. The total cost of the dam, including preliminary examinations, permanent road construction, permanent cottages, right of way, etc., amounted to slightly less than one and a half million dollars. The cost of camp maintenance amounted to 1.15 per cent of the total; that of engineering and inspection, to 2.30 per cent; that of superintendence and accounts, to 1.62 per cent; and general expense, to 4.89 per cent. The total quantities of the different classes of work, total costs, and average unit costs are given in the accompanying table.

Cost of Black Canyon diversion dam

Class of work	Total quantity	Unit	Total cost	Unit cost
Examination and surveys			\$14,816.22	
Permanent road to dam			5,769.15	
Permanent cottages			7,733.00	
Right of way			69,155.71	
Cofferdams			70,050.27	
Excavation, all classes	68,145	Cu. yds.	172,397.63	\$2.53
Excavation, hydraulic	8,614	do	5,119.60	.59
Structure drainage	2,029	Lin. ft.	5,969.52	2.94
Concrete, plain	73,279	Cu. yds.	555,340.74	7.60
Concrete, reinforced	5,840	do	128,694.06	22.00
Pipe hand rail			5,818.15	
Lighting system			4,191.13	
Grouting	3,574	Lin. ft.	8,170.72	2.29
Cast-iron slide gates			5,093.02	
Drum gates			110,601.52	
Radial gates			5,277.09	
Sluice gates			19,872.54	
Trash rack			2,514.19	
Back fill	628	Cu. yds.	458.86	.73
Pumping system			106,616.13	
Power system			25,118.16	
Siphon			14,851.93	
Camp maintenance			17,097.92	
Engineering and inspection			34,374.05	
Superintendence and accounts			24,243.52	
General expense			72,959.97	
Grand total cost			1,492,304.80	
Estimated cost			1,800,000.00	

ABOUT 6,000 dozen eggs per week are being shipped from the east division the Umatilla project.

PLANs are on foot for promoting settlement of the Belle Fourche project with a group of Hungarian farmers who will become owners of the unoccupied tracts and thereby advance the sugar beet and dairy industries. The pastor of the Hungarian Church at Rapid City, S. Dak., is interested in the plan and will act as agent to secure the colonists.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, returned to Washington on July 27. During his absence P. W. Dent, assistant commissioner, was acting commissioner.

Kenneth C. Tippy, chief of field party, Kittitas division, Yakima project, has resigned to accept appointment as junior engineer, United States Geological Survey, for duty in the New England States.

Miss Mac A. Schnurr, secretary to the commissioner, returned to the Washington office from her European trip on July 23.



Form and steel preparatory to placing concrete, culvert station 39, North Branch Canal, Kittitas division, Yakima project, Washington

R. F. Walter, chief engineer, left the Denver office the latter part of the month, in company with J. L. Savage, chief designing engineer, for an extended inspection of the several projects where large construction work is under way.

George C. Kreutzer, director of reclamation economics, returned to the Washington office from a field trip on July 14.

C. N. McCulloch, chief clerk of the Washington office, spent two weeks recently at the home of his mother in Greenville, S. C.

Ralph H. Nelson, chief of party, has been transferred from the Orland project, California, to the Minidoka gravity extension unit, Idaho.

Recent visitors at Stony Gorge Dam included Walter E. Packard, chairman, Mexican Irrigation Commission; Jose Mares, Mexican Irrigation Commission; Miguel Solorzano, irrigation engineer, Mexican Government; Oliver T. Erikson, Seattle; A. N. Burch, Sacramento; and R. J. Coffey, district counsel, Berkeley.

James J. Dolan has been reinstated in the Denver office as assistant engineer, for temporary employment during the summer months. Mr. Dolan was formerly employed in the designing section of the Denver office and resigned to accept a position as instructor of engineering in the University of Illinois.

Gov. George H. Dern, of Utah, was a recent visitor at Echo Dam, Salt Lake Basin project.

A party of 18 members of the Yakima Chapter of the American Association of Engineers made a recent trip of inspection over the main canal, Kittitas division, Yakima project.



Warm Springs dam and reservoir from right bank of Malheur River, Vale project, Oregon

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wildo Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siehenelcher.....	-----	Wm. J. Burke.....	Mitchell, Nehr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	-----	B. E. Stoutemyer.....	Portland, Oreg.
Carlshad.....	Carlshad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ¹	Ballantine, Mont.....	E. E. Lewis.....	-----	-----	-----	-----
King Hill ¹	King Hill, Idaho.....	F. L. Kinkaid.....	-----	-----	-----	-----
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	E. E. Chahot.....	do.....	Do.
Minidoka ¹	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ¹	Fallon, Nev.....	A. W. Walker.....	-----	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ¹	Mitchell, Nehr.....	H. C. Stetson.....	Virgil E. Huhbell.....	Virgil E. Huhbell.....	Wm. J. Burke.....	Mitchell, Nehr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weher.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nehr.
Salt River ¹	Phoenix, Ariz.....	C. C. Cragin.....	-----	-----	-----	-----
Shoshone ¹	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	-----	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ¹	Payson, Utah.....	Lee R. Taylor.....	-----	-----	-----	-----
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Oreg.....	A. C. Houghton.....	-----	-----	-----	-----
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....	-----	-----	-----	-----
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
-----	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Phillebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹¹	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹²	E. R. Mills.....	-----	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gihson Dam.....	Augusta, Mont.....	Ralph Lowry ¹²	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹²	C. B. Funk.....	-----	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

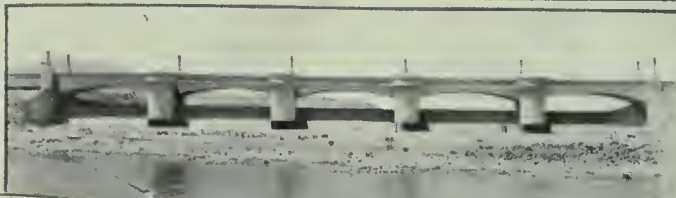
¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

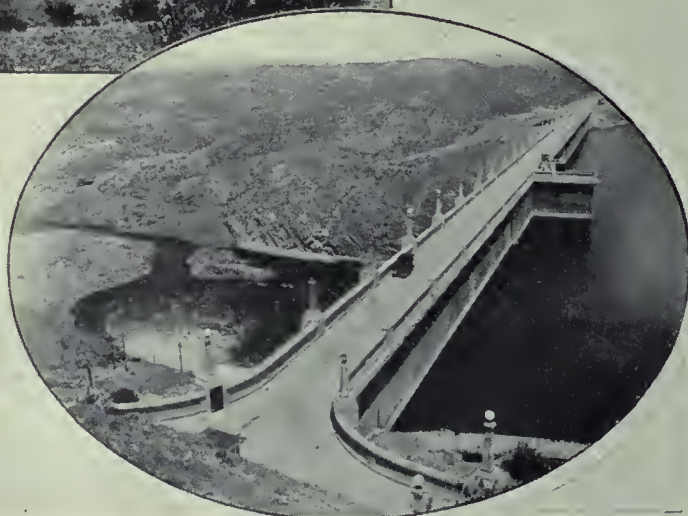
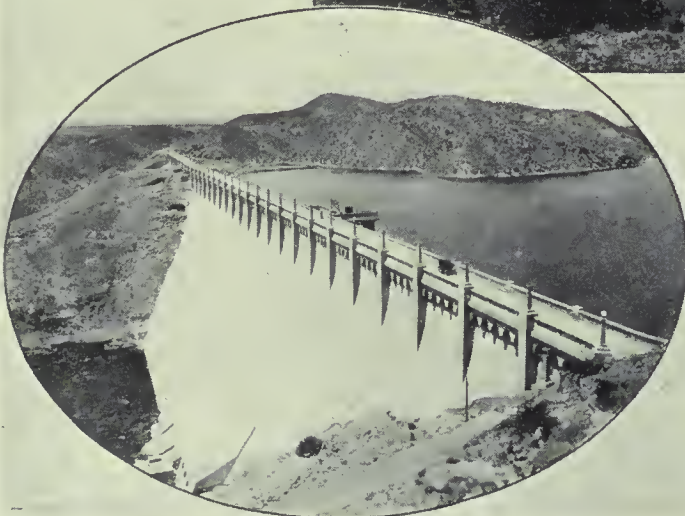
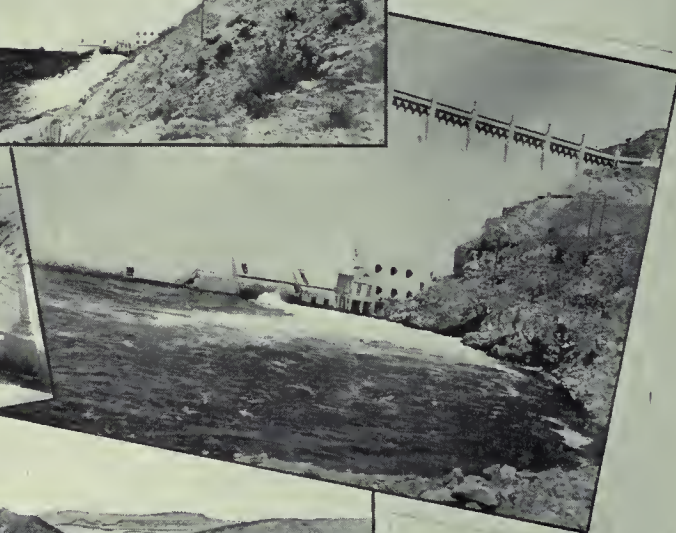
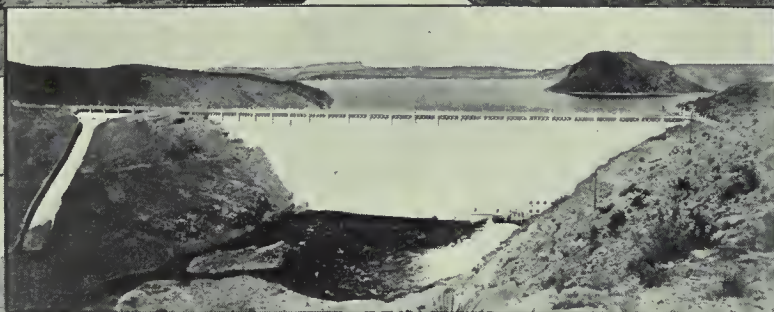
Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Denver, Colo.....	-----	Middle Rio Grande conservancy district.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	-----
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	-----

RIO GRANDE PROJECT
NEW MEXICO
TEXAS



ELEPHANT BUTTE DAM
RESERVOIR, SPILLWAY
AND EMBANKMENT



NEW RECLAMATION ERA

VOL. 19

SEPTEMBER, 1928

NO. 9



HON. ROY O. WEST, SECRETARY OF THE INTERIOR

SECRETARY WEST VISITS PROJECTS

HON. ROY O. WEST, Secretary of the Interior, is making an inspection of several reclamation projects in order to get first-hand information concerning their operation and problems. At this time he plans to visit the Milk River and Sun River projects in Montana; the Lower Yellowstone project, Montana-North Dakota; and the Shoshone and Riverton projects, Wyoming.

The Secretary will be accompanied by Dr. Elwood Mead, Commissioner of the Bureau of Reclamation, and Hon. Louis C. Cramton, chairman of the Subcommittee of the House Committee on Appropriations for the Interior Department



NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

ROY O. WEST
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

September, 1928

No. 9

Interesting High Lights on the Federal Reclamation Projects

THE Stony Gorge Dam, Orland project, was 97.9 per cent completed at the end of July, with only 360 cubic yards of concrete remaining to be placed in the dam.

ABOUT 140 tons of dried apricots were shipped recently from the Orland project, 25 tons being marketed by the Orland Prune and Apricot Association.

AFIRM with headquarters in Arizona, dealing in fruit and produce, has leased warehouse room at Rupert, Minidoka project, for the purpose of packing a fancy grade of potatoes. Hand-picked potatoes will be packed in small bags and cartons.

A MEETING of the potato growers' association was held recently on the Milk River project and plans were made for the early visit of Southern potato growers. Consideration was also given to the price for the 1928 seed potato crop.

MELONS from the west extension division of the Umatilla project were on the market two weeks earlier this year than last. They were being marketed at a good price through two local associations.

WORK has been started by the Southern Pacific Co. on the construction of the Modoc Northern Railroad through the Klamath project.

FLY Field, which adjoins unit B, Mesa division, Yuma project, was one of the official landing fields for the fourth annual reliability tour. Twenty-two planes landed and were refueled, and the pilots and passengers furnished refreshments. About 10,000 people were at the field to welcome the fliers.

AT the end of the month roadbed grading for the 24 miles of railroad to the Owyhee dam site, Owyhee project, had been practically completed, 15 miles of track had been laid, and 8 miles ballasted ready for service. Plans for immediate work at the dam site include excavation of the open cut for the diversion tunnel, construction of a trestle for the disposal of tunnel muck, completion of the road to the top of the east abutment, and stripping of the rock faces of the dam abutments.

CONSTRUCTION has begun on a new box factory in East Omak, Okanogan project. The factory will be larger than the old one, which is to be abandoned, and will employ about 50 additional men.

PROSPECTS continued excellent for practically all crops on the Yakima project. The second cutting of alfalfa was very good, corn was in a thriving condition, and wheat was reported to be yielding from 40 to 80 bushels per acre. Picking of cherries and apricots had been completed, the quality and yield being reported as excellent.

THE Shoshone project output of butterfat during the month was 15,812 pounds. About 10,250 pounds of butter were manufactured and 1,450 gallons of ice cream.

THE North Platte Cooperative Cheese Co. has awarded a contract for the construction of a new cheese factory at Gering, Nebr. The building will be 120 by 60 feet and will be the largest and most modern cheese factory in the State. The plant will have an initial capacity of 80,000 pounds of milk or 10,000 pounds of butterfat a day, and provision will be made for an ultimate capacity of 100,000 pounds of milk.

IMPORTATION of dairy stock to the North Platte project continues. Several cars were received and distributed recently, and the Dairy Development Association estimates that approximately 1,000 more cattle will be shipped in during the present year if satisfactory stock can be purchased.

THE first bale of cotton of this season's crop on the Yuma project was ginned on July 24 and brought premiums furnished by local merchants to the amount of \$180. The bale was then auctioned off and netted the grower, together with the premiums, approximately \$300. The yield this year from about 32,000 acres is expected to be about 35,000 bales, with a large area contracted for by buyers at 21 cents a pound.

AN anniversary picnic was held recently by the stockholders of the Boise Valley Dairymen's Creamery at Caldwell, with an attendance estimated at 8,000. There are 1,875 stockholders, and the total output of butter for the year is expected to reach 3,000,000 pounds.

THE Los Angeles-Salt Lake Airways are contemplating the establishment of beacon lights in the vicinity of Derby, Fernley, and Parrin, with a landing field near Fernley, Newlands project, Nevada.

AT Gibson Dam, Sun River project, 16,000 cubic yards of concrete were placed in the dam during the month, bringing the total to 81,500 cubic yards, with 79,000 cubic yards still to be poured.

AT the end of the month district No. 1, Lower Yellowstone project, was fully paid up on construction and had an advance on operation and maintenance of \$5,852.55 over the amount due.

Electricity on an Irrigated Farm, Boise Project, Idaho

By J. F. Bruins, R. D. 2, Boise, Idaho

UNLIKE a famous comedian who claims to get all his information from the papers, all I know about using electricity on an irrigated farm was gained by personal experience, so this account must make liberal use of the first personal pronoun.

Twelve years ago, an ex-Government employee, broken in health, I undertook to farm. I first bought a 40-acre tract in Boise Valley and left to later developments the possibility of making a living on it. Of course my idea was principally to be an example to and uplift my benighted neighbors, but after a year or so in which I succeeded only in amusing them I abandoned them to their ungrateful fate and instead took stock of my situation to solve the acute problem of making ends meet for myself.

I had gone in principally for dairying and at that time had seven cows, and it was taking all my time to raise feed and care for them. I milked by hand, pumped water most of the year the same way, turned the separator crank, carried a lantern morning and evening, and stumbled around doing my chores by its dim light. I irrigated with a dull shovel all the first year because I didn't know enough to sharpen it, and it was too much work to do it with a file, anyhow, and I hauled my grain 6 miles to the mill as a matter of course. In the house I sat by an oil lamp evenings and often went to bed because the chimney broke or the oil gave out and all ordinary electrical comforts of city life were out of the question. Cooking was the worst problem. I did that on an oil stove and one Sunday morning I went to work with breakfast cooking and came back later to find the stove had been smoking and the soot in that house simply had to be shoveled out. I state without fear of successful contradiction that at that moment I would have given any amount of independence for the offer of my old Government job.

ELECTRICITY ON THE JOB

Well, the power line was a quarter of a mile away. At that time extensions to farms were rare and undertaken with much misgiving, but after some persuasion and guaranteeing of charges I induced the company to run a line to my place, taking in one other user on the way. I don't mean to say that any miracle followed. My capital was limited enough to satisfy the most harrowing story of early struggle, and I got in electrical equipment only as

means and experience warranted, but life did begin to get brighter. First were the lights. In the house they were convenient. In the barn they made intolerable gloom and difficulty a memory and work at night easy and pleasant. Then came a pump. I used to spend at least half an hour a day pumping by hand. The first pump with motor cost about \$100. It was the wrong kind and wore out too soon to be satisfactory for that kind of service, but it saved half an hour of the meanest kind of work, and I could use water freely for all purposes. Then came the separator. That cost about \$150, but it was a good one of large capacity. That separated the milk while I was at the last cow and saved another half hour a day. It is still in excellent condition after nine years of service. These two economies of time, together with the lights made it possible to keep more cows, and I got up to 10 with no more work than the 7 had been previously. What was more important was that for the first time I began to have a margin of receipts over expenses.

About that time things were going so well in the barn and so poorly in the house that I undertook to get married. The lady with whom I was negotiating the deal had never lived on a farm and felt much hesitation about trying it, but the prospect of having electrical conveniences in the house besides running water in sink and bathroom had a considerable influence on her decision. That was seven years ago, and while this is not a romance, the world is duly assured that the results have been satisfactory to all concerned.

ELECTRICITY IN THE HOUSE

To go to that side of the story. She first specified an electric range because she had never cooked over any but a gas fire. The first range cost \$40 second-hand, but gave good service for several years. Speaking of ranges we have found that the cost of current is no greater than that of fuel for a coal fire, but that the upkeep is higher. Current costs about \$3 to \$4 a month for our family of five, but the cost of upkeep brings the total to about \$5 a month for electric cooking. We also installed a water heater, but found that while the continuous use of a 1-kilowatt heater gave abundant hot water the company found the business so unprofitable that the rate was raised, so now we use mostly a coil in the furnace in winter and have a little stove in the kitchen for summer use which not only heats water but adds

greatly to the comfort of chilly mornings. I doubt if it is commonly practicable to heat water by electricity. A washing machine came next. Our income was growing but so was the size of the family, and we still had to economize, so we got a secondhand one for \$50, which with trifling repairs became very serviceable and is still in use after seven years. Along with the pump we could have running water in the house and modern plumbing, which by the purchase of \$15 worth of plumbing tools and a little ingenuity were installed at a total cash cost of some \$150. An iron and toaster came early in the game. A local store put on a sale of rebuilt vacuum cleaners at \$16, so one was added. A little fan cost only \$5, has been in use six years, is still good, and has returned a million dollars worth of comfort. We have found that electrical appliances have added so much to the pleasure of home life and so little to its cost that we have somewhat got into the habit of getting them as presents to each other, so we now have besides those mentioned a heating pad, glow heater, percolator, waffle iron, radio, solder iron, sewing machine, curling iron, and probably others I forget. So far as the home is concerned if Peter of the nursery rhyme had used an electrified kitchen he never would have had to resort to a pumpkin shell to maintain domestic discipline.

MORE ELECTRICAL EQUIPMENT FOR THE BARN

To get back to the barn. I had got up to 20 cows, and milking them by hand even under electric lights was a tedious job and after much hesitation I put in a milking machine about 18 months ago. I had a motor and got a discarded milking machine and fixed it up for less than \$100, complete, and while there are objections to the use of milkers I would personally rather quit dairying than go back to milking by hand. I now milk my 20 cows in about an hour. This is of vital importance on an irrigated farm because otherwise milking interferes with the irrigating which comes mostly at the same time of day. I have not noticed any bad effect whatever on the cows and am inclined to think that when a man condemns a milker he merely confesses his own failure as an operator. To run one, however, the steady dependable power of electricity is practically essential.

Another barn use has been a tool grinder. I have found a small power

grinder so convenient as to be essential in keeping farm tools sharp, and the cost is trifling. I also use the milking machine motor on a small feed grinder which runs slowly, of course, but that does not matter because I can meanwhile be doing other chores, and it saves sacking grain and hauling it 6 miles to and from town besides the grinding charge. Recently I have been building a new barn to replace the old cow shed and had occasion to mix some 50 yards of concrete for it. After two days of a losing fight to get a gas engine to run the mixer I took out the same motor, put a 1¼-inch pipe coupling

on the shaft in place of the pulley, put on the belt and our power troubles were over. The first morning with the motor we made as much concrete as we had during the two days of struggle with the gas engine.

One of the most valuable developments of electricity from my point of view has been its use for irrigation pumping. We have dry years even in Boise Valley, and with ground water only 25 feet from the surface in a porous gravel I have found it entirely possible to get a full supply from an inexhaustible reservoir and at a reasonable cost. This development would

be a separate story and too long to tell here, but I have found it possible to get a flow of about 20 inches of water from my well at a total cost of about \$3 per acre-foot. In my opinion the next major development of irrigation engineering will be to accomplish drainage and furnish supplemental irrigation water by this means.

Electricity is not, of course, a complete answer to the problems of irrigation farming, but for convenience, comfort, and actual help it is one of the most important factors in making a success of the home and business.

The Influence of the Dairy Cow on the Payment of Charges

A composite picture of the farm owner on the Sunnyside division of the Yakima project, milking from two to eight cows and always able to meet his operation and maintenance charges

By Maurice D. Scroggs, Irrigation Monogrer

THE following table is taken from one that appeared in the 1927 Annual History for the Sunnyside Division of the Yakima Project, Washington:

Public notice water-right farms using water in 1927	Dis-counted operation and maintenance bills	Farmed by owners
	Per cent	Per cent
Those having no cows.....	33.4	43.3
Those having some cows.....	40.4	69.7
Those having from 2 to 8 cows.....	43.9	70.6

This table indicates, among other things, that the cow has some influence on repayments. This impression was strengthened when further study showed that 82.3 per cent of the public notice farms with from two to eight cows and farmed by owners not only had discounted their 1926 operation and maintenance bills but had never been delinquent more than once. It was also found that 59.3 per cent had never been delinquent in paying operation and maintenance charges.

It seems that it might be worth while to have a composite picture of the farm owner on this division, milking from two to eight cows and always able to meet his operation and maintenance charges. The crop census for 1927 and the 1925 classification was the camera used to get this picture.

This farmer settled on the project in 1915. He has had 19 years of farming experience, 17 years of which were in irrigation farming. He has a family of four persons. He farms largely with his own labor but has help for about five months of the year, usually his son. His farm, with improvements, is valued at \$8,654, or \$262.57 per acre. His farm

is not the best, but is a good farm of good soil and fair topography and was placed in class 2 by the classifiers for the board of survey and adjustments in 1925. He milks 4 cows, has 10 sheep, 7 hogs, 117 fowls, and a two-horse team. The total value of stock is \$722 and of farm equipment \$249. He also has either a low-priced or secondhand auto. His farm is located 1.8 miles from a shipping point and is not situated in any particular section of the project.

There are 29.15 acres in his farm. About one acre is taken up by houses, barn, corral, and a small garden. He has 12 acres in alfalfa, 3 acres in pasture, 2 acres in corn, and the balance of his acreage is either in orchard or devoted to cash crops, principally potatoes and wheat. He may vary the latter with squash, rutabagas, carrots, barley, aspara-

gus, oats, cantaloupes, and tomatoes. His alfalfa averaged 4 tons to the acre, potatoes 303 bushels, corn 44 bushels (plus fodder and silage), apples 8,700 pounds, asparagus 3,253 pounds, grapes 6,500 pounds. In fact, most of his crops yielded well over the project averages, owing undoubtedly to the fertilizer available from livestock on the farm.

There are some features of this composite farmer which are very hazy in the picture. He may have some bees, but probably not. He may have a silo, but probably not. He is just as apt to have a purebred sire with his small herd of dairy cattle as a scrub bull, but is surer to have none. He may have a truck, but this is doubtful.

However, the other features mentioned above are quite distinct. The resultant picture is not altogether displeasing.



Good dairy cattle help pay the bills

Solving Surplus Crop Problem by Cooperation

Editorial from the Mercedes (Tex.) News August 3, 1928.

THERE has been in progress for more than two weeks at the University of California, Berkeley, Calif., the annual convention of the American Institute of Cooperation. Because this is the most widely attended convention ever held by this organization and because it was in session in the American State which first successfully developed an organization of growers to handle the distribution of their commodities, the gathering is of unusual interest everywhere. It is of particular moment in the lower Rio Grande Valley because cooperation promises to be the salvation of this very fertile region.

A great many authorities on cooperative marketing were there, including representatives of 33 States of the Union, 3 Provinces of Canada, and 8 foreign countries. As was to be expected, the discussions turned to overproduction, the handling of surplus crops, and restricted plantings. How deeply these problems are being studied, the speeches showed, nor could any of the speakers point out an exact antidote for this situation.

"Discover," said C. C. Teague, chairman of the American Institute of Cooperation and president of the California Fruit Growers' Exchange and the California Walnut Growers' Association, "how to control surplus production or overproduction of agricultural commodities and you will have solved the big question before American farming to-day. There is distress in many lines of agriculture due to overproduction, often due to lack of proper distribution or development of markets. A real problem indeed is presented when all known remedies, including economical distribution, national advertising, and reduction of producer-consumer margins have been applied and found wanting. Men will work together if they can ship their entire crop, but when you ask the growers to leave part of their crop in the fields or on the tree, or otherwise dispose of it at less than the market price, cooperation is likely to fall apart."

Teague declared that overproduction control can be effected only by a well-seasoned cooperative organization which handles a large percentage of different commodities. The organization, he said, must practice a merchandising program that permits withholding a percentage of the production and diverting this into by-products, giving the grower a better price for his entire crop than he would receive independently.

I. W. Heaps, secretary-treasurer of the Maryland State Dairyemen's Association,

said that control of production is one of the vital factors in surplus disposal and control. He said further:

It is my opinion that we should endeavor to control production first and then plan to dispose of the surplus later. If we control production we can largely eliminate surpluses. I feel the time has come when cooperative marketing organizations should be more than mere bargaining associations. They should endeavor to set up such marketing plans and policies as are fair between producers and will tend to control production to an amount equal to the consumptive demand.

The problem of controlling the surplus of farm products generally resolves itself into two major issues—regulating production of the product from the seasonal standpoint, and controlling production to equal, as nearly as possible, the consumptive demand of the particular product. In any attempt to regulate seasonal demand the weather factor will be found to be the most serious consideration. The second problem of controlling production through a definite policy among the farmers of a commodity organization may be found almost as difficult.

However, very definite results can be obtained by ascertaining the amount of the product normally consumed and allocating to the producers a basic amount equal to the consumptive demand, based on the individual producer's production over some period during previous years. The quantity of that product produced over and above the normal demand becomes a surplus and should be marketed as such. No producer should be limited in production, but each would receive the basic price for only his share of the market.

In the Baltimore milk market, Heaps said, the penalty of overproduction has been shifted to those individual farmers who will not comply with economic market conditions in their production program.

Surplus disposal is merely using good business judgment in disposing of a crop, E. T. Haack, manager of the Central California Berry Growers' Association, said.

"Surplus problems," he declared, "will stare every cooperative in the face sooner, later, or always, and I have yet to hear of a plan that is workable under all conditions. A reasonably successful plan of one organization may prove disastrous when adopted by another."

Ralph P. Merritt, manager of one of California's largest cooperative firms, asserted that "no single method exists for the solution of all problems of marketing. A cooperative marketing organization that may be successful in one locality may fail in another, or a cooperative that makes a success in handling one sort of commodity may make a dismal failure in trying to put across another.

The organization must be made to fit the case."

Merritt defined cooperative marketing as "the act of the working together of producers of agricultural products to improve their opportunities in marketing by the adoption of methods best suited to the point of view to the producer, to the commodity, and to the channel of distribution."

"Our problem," he continued, "mainly is one of uncontrolled surplus. The human and economic problem are interlocked and dominate to a great degree the mechanical problem involved in the cooperative marketing of our farm products."

J. M. Newhouse, of Portland, Oreg., manager of the North Pacific Prune Exchange, told how his State solved a problem of local interest. "Oregon," he said, "solved the cooperative marketing problem by getting the growers' viewpoint and keeping it. We determine our policy by the growers' desire, and this we obtain through meetings where the producers are asked to freely express their opinions."

E. L. Adams, manager of the California Rice Growers' Association, explained how an agreement between growers and millers to effect an export project had solved a marketing problem two years ago. Practically 20 per cent of the rice crop of California, he said, was exported to Japan, where it brought 18 per cent less than that sold in the domestic market. But local prices were increased 35 per cent by the move, resulting in an approximate gain of \$2,000,000. He warned, however, that price setting is a dangerous practice.

The cooperative movement in farming has come to stay and is a billion-dollar business. Charles W. Holman, executive secretary of the American Institute of Cooperation, declared:

When the present cooperative organization began in 1912 there was only one conspicuously successful cooperative association in the country, the California Fruit Growers' Association. There are now 13,000 farmer organizations doing a billion-dollar business. Of this number, 150 in the last year have done business amounting to more than a million dollars apiece, and several have passed the \$50,000,000 mark. A million and a half farmers are now members of cooperative associations.

The organization of these associations is similar to that of the ordinary business corporation, except that the members vote as individuals and not by stock. The ordinary corporation also exists for the apportionment of dividends. The farmers' organizations pay dividends in a way but exist primarily to serve the membership by intelligent fixing of prices and standards.

The quality of farm products has been appreciably raised by standards set for the membership.

The cooperative organizations also aid the farmer by maintaining officers in Washington, D. C., to watch legislation. The cooperatives investigate thoroughly each measure and only send witnesses to combat inimical measures when they are sure they are detrimental to agriculture and have the facts to prove it.

But in spite of the size of the cooperative movement it is still in need of leaders for further expansion.

In respect to legislation, Holman urged the setting up of a national agency to present the common views of the cooperatives before a legislative body. His suggestion was approved, and a committee of seven will be appointed to meet this fall and make arrangements for the project's execution.

Representatives of the valley cooperatives are in attendance at these meetings and may be expected to return with a great many beneficial ideas.

Colorado River Board Organizes

Maj. Gen. W. L. Sibert is elected chairman and C. P. Berkey secretary

THE board of three engineers and two geologists, appointed by Dr. Hubert Work, shortly before his retirement as Secretary of the Interior, to make a study of and report on the feasibility of the site for a storage reservoir on the Colorado River either in Boulder Canyon or Black Canyon, met for the first time on July 30 in the building of the Department of the Interior in Washington. Organization was effected and a tentative program mapped out.

Maj. Gen. William L. Sibert, United States Army, retired, was selected as chairman, and Charles P. Berkey, of New York, secretary. Dr. Elwood Mead, Commissioner of Reclamation, Department of the Interior, met with the board in an advisory capacity.

There was a general discussion of the proposed reservoir site. The decision was reached by the board to visit Denver, Colo., on August 13, where the mass of

information to be considered concerning the project is located. Further plans concerning its work will be determined by the board after it reaches Denver. Meantime, the board is going over the records of the Department of the Interior relative to the project.

The board was authorized at the last session of Congress "to examine the proposed site of the dam (Boulder or Black Canyon of the Colorado River), and review the plans and estimates made therefor, and to advise him (the Secretary of the Interior) prior to December 1, 1928, as to matters affecting the safety the economic and engineering feasibility, and adequacy of the proposed structure and incidental works."

The members of the board are Maj. Gen. William L. Sibert; D. W. Mead, engineer, Madison, Wis.; Robert Ridgway, engineer, New York; Charles P. Berkey, geologist, New York, and W. J. Mead, geologist, Madison, Wis.

In designing an irrigation system it is important that the method of delivery of water best suited to local conditions be taken into consideration.



The Colorado River Board

Left to right: Hon. Roy O. West, Secretary of the Interior; Hon. Hubert Work, former Secretary of the Interior; Hon. E. C. Finney, First Assistant Secretary of the Interior; Warren J. Mead, member of board; Dr. Elwood Mead, Commissioner of Reclamation; Robert Ridgway, member of board; Maj. Gen. William L. Sibert chairman of board; Charles P. Berkey, secretary of board; D. W. Mead, member of board

Echo Dam, Salt Lake Basin Project, Utah

An earth and rockfill dam on the Weber River in Utah for the storage of irrigation water

By B. W. Steele, Engineer, Denver Office, Bureau of Reclamation

THE site of the Echo Dam, the first structure to be built on the Salt Lake Basin project, is on the Weber River about 30 miles northeast of Salt Lake City, Utah, and about 1 mile above the town of Echo on the main line of the Union Pacific Railroad. The capacity of the reservoir created by the construction of Echo Dam will be 74,000 acre-feet.

The development of additional water supply for the Weber and Provo River Basins contemplates the diversion at certain times of the year of water from the Weber River to the Provo River. To accomplish this diversion and as a part of the present Weber River development the Kamas diversion dam and canal will probably be constructed at some future time. The Kamas diversion dam will be located on the Weber River about 25 miles above Echo Dam. The diversion canal will be about 8 miles long, extending from the diversion dam in a southerly direction to the Provo River watershed.

The construction of Echo Reservoir and the Kamas diversion dam and canal will provide a means of supplementing the water supply of lands under constructed canal systems diverting from Weber and Provo Rivers. No interference with or impairment of present water rights is anticipated.

The building of this reservoir necessitates the relocation of the Park City branch of the Union Pacific Railroad and the Lincoln Highway around the reservoir. The relocated railroad and highway are being constructed just above the reservoir water surface on the east side of the river. The estimated contract cost of the relocated railroad and highway is about \$387,000, exclusive of material, track, surfacing, and overhead costs, and the contract for this work has been let to the Utah Construction Co. of Ogden, Utah. It will be necessary to complete the relocation of the railroad and highway before much can be accomplished on the main fill for the dam since the original location of the railroad through the reservoir area is along the river bottom.

FOUNDATION CONDITIONS

The geologist's report on the dam site indicates that the channel of Weber River at this point is a natural stream and not a faulted channel. The area is composed of a low-lying synclinal structure, the eastern limb resting against the Coalville Dome and the western limb against the faulted Henefer Uplift.

The dam itself is to be placed somewhat east of the center of the synclinal structure. The rock outcrop on either side of the river is Wasatch conglomerate made up of fine grit, coarse sand, small pebbles and rocks to the size of 6 to 8 inches in diameter. Owing to the overburden at this site an earth-fill dam is the only type of dam economically feasible. The overburden across the river bottom consists of 25 to 30 feet of soil underlaid by about the same thickness of sand and gravel of a more or less pervious nature. The abutment slopes at either end of the dam carry a fairly heavy cover of clay, sand, and gravel over sandstone and conglomerate at different points.

FOUNDATION TESTING

Testing of the foundation was carried on at different times since 1905, both by private interests and this bureau. About 30 holes and pits were sunk on the dam and spillway site, but only a part of these extended to the underlying sandstone or conglomerate. The left abutment was tested sufficiently to locate solid rock for the outlet tunnel, but the test pits on the spillway location did not develop rock on which to locate the spillway gate structure. The lower end of the spillway channel lining will be located in conglomerate of poor quality.

A survey of the available material for the embankment included the sinking of various test pits and indicated three available borrow pits. One of these is located on the west side of the river above the dam, in which the depth of material varied from 15 to 60 feet and which contains about 1,700,000 cubic yards. Another is on the east side of the river between the dam and Echo Creek and varies from 20 to 30 feet in depth and contains approximately 600,000 cubic yards. The other one is a short distance above the dam on the east side of the river, varies from 20 to 40 feet in depth, and contains about 800,000 cubic yards. The material in the first mentioned pit and from the area just below the dam on the same side of the river and adjacent to the spillway channel will probably be used for the clay, sand, and gravel portion of the embankment.

The river bottom both above and below the dam site was prospected very thoroughly for concrete aggregates, and an abundant supply of fairly well graded aggregates was found in three separate areas or districts. These areas were

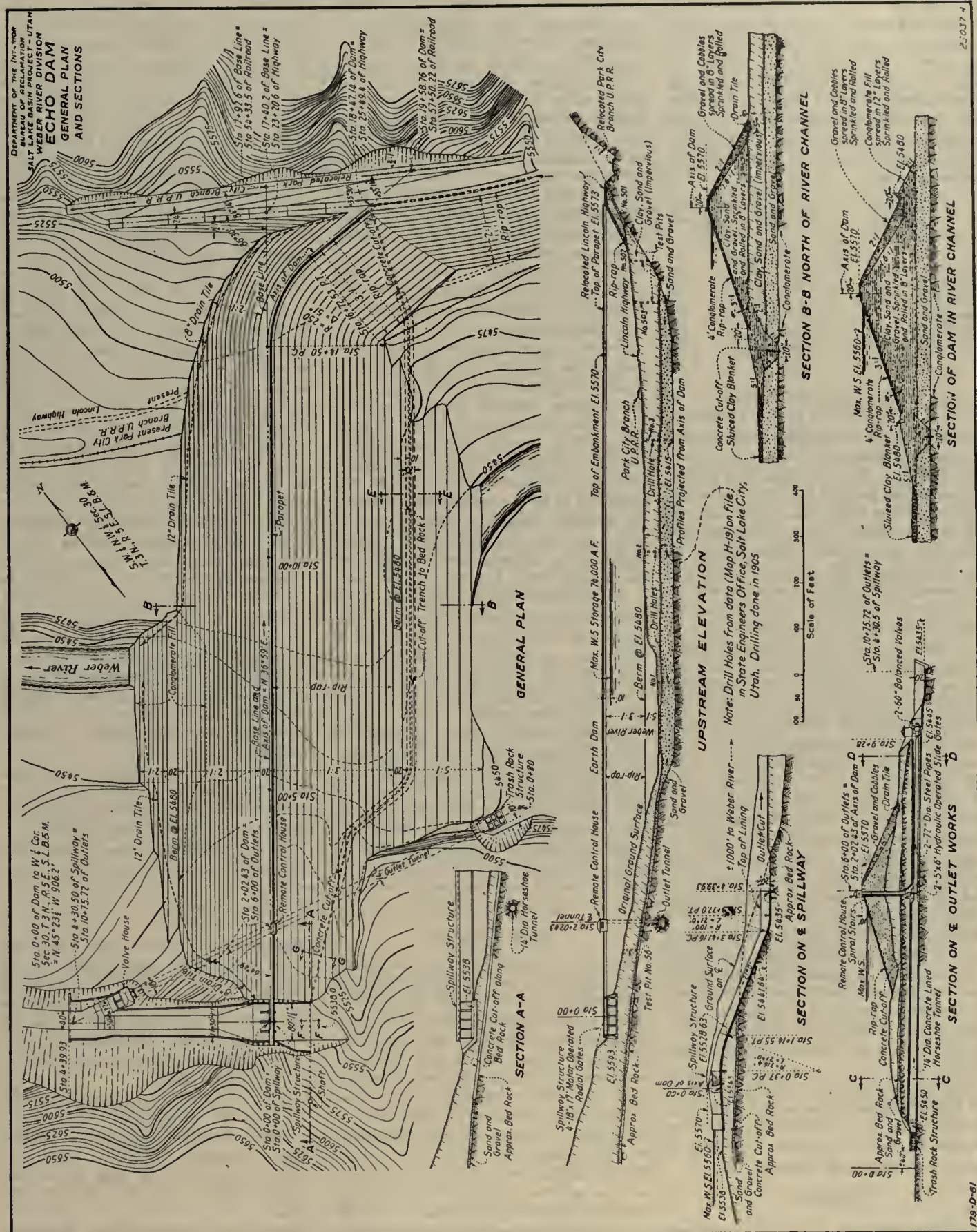
tested by open test pits and samples of the material were submitted to the Bureau of Standards in Denver for concrete compression tests which indicated a very satisfactory product, structurally sound and fairly well graded for the class of work for which it was desired.

The testing of the dam and spillway sites and of the borrow pits for the different classes of material involved the digging of 71 test holes which totaled 1,235 feet of hole. The major part of this testing was done in the winter of 1924 and 1925.

THE DAM

Serious consideration was given to the adoption of a sluiced embankment of the Tieton Dam type, but this type of dam was eliminated owing to considerations of design and economy. Stability studies indicated that the puddle core would occupy an unusually large portion of the section of the dam owing to the gradation of the available materials, and there was serious question as to the stability of the slopes during construction. The analyses of the available embankment materials indicated that only about an average of 9 per cent of the material is gravel over 1 inch in diameter. If a sluiced embankment was built, the puddle core would necessarily have to be located near the center of the dam which would move the deep cut-off trench a considerable distance downstream from its adopted location, reducing very materially the percolation distance below the cut-off.

The cut-off trench, which will be excavated through the sand and gravel of the river bed to the underlying conglomerate, will be backfilled with earth, sprinkled, and rolled as a part of the earth-fill portion of the dam. In the bottom of this cut-off trench will be built a concrete cut-off wall keyed into the underlying conglomerate and extending a distance of 12 feet into the earth of the cut-off trench. On either abutment and above the sand and gravel area the concrete cut-off wall will be constructed in a cut-off trench excavated with vertical side walls wherever feasible. On the left abutment it is contemplated that a portion of the concrete cut-off will have to be constructed in stoped excavation owing to the nature of the formation as disclosed by the drill holes which indicate a pervious layer of material overlying the conglomerate and sandstone and underlying the more impervious material on which the radial gate spillway structure will be located.



Material for the embankment will probably be obtained from borrow pits at the left abutment end of the dam within a radius of a quarter of a mile of the end of the dam. The material is a mixture of clay, sand, gravel, and cobbles with very little material over 1 inch in diameter. The following is the analysis of a typical sample of the material for the embankment as taken from the left abutment above the dam:

Material	Size	Per cent
	<i>Millimeters</i>	
Gravel.....	Over 2.....	13.0
Fine gravel.....	2-1.....	1.0
Coarse sand.....	1-0.5.....	1.6
Medium sand.....	0.5-0.25.....	2.2
Fine sand.....	0.25-0.1.....	15.5
Very fine sand.....	0.1-0.05.....	32.0
Silt.....	0.05-0.005.....	19.3
Clay.....	0.005-0.000.....	15.4

The embankment will consist of a sprinkled and rolled fill having a theoretical top width of 20 feet and upstream and downstream slopes of 3 to 1 and 2 to 1, respectively. The upstream and downstream slopes are each broken at elevation 5,480 or 90 feet below the crest, by a berm 20 feet in width. On the downstream slope this 20-foot berm will be the top of the conglomerate fill which will serve the purpose of a downstream cofferdam during construction. The slopes of the conglomerate fill will be 2 to 1 on both sides. It is assumed that the material for this conglomerate fill will be obtained from the outlet tunnel and spillway channel excavations and from borrow.

The downstream portion of the embankment will be composed of gravel and cobbles, the top slope being 2 to 1 and the under slope 1.6 to 1 with a top width of 10 feet at the top of the dam. The upstream slope of the embankment will be protected above the 20-foot berm at elevation 5,480 by a 4-foot layer of dumped conglomerate riprap. The remainder of the fill will be composed of clay, sand, gravel, and cobbles deposited in 8-inch layers moistened to such an extent as to secure maximum consolidation and rolled with a roller weighing at least 2,000 pounds per linear foot of tread and making at least three passes over each portion of each 8-inch layer. The contractor proposes to use a Rohl roller for compacting the fill.

The theoretical top width of the dam of 20 feet will be increased to 25 feet by the construction of a reinforced concrete cantilever wall or parapet extending 3 feet above the top of the dam.

SPILLWAY

A flood discharge of 15,000 second-feet will be provided for by means of an open concrete-lined spillway channel located

in the left abutment. Spillway discharge will be controlled by four 18 by 17 foot motor-operated radial gates mounted in a reinforced concrete structure located in line with the crest of the dam.

The spillway discharge capacity at normal water surface of 15,000 second-feet is approximately three times the maximum flood of record in the Weber River at the gauging stations at Devil's Slide just below the mouth of Lost Creek and about 9 miles downstream from the dam. The principal streams entering the Weber River between the dam site and the gauging station are Echo Creek and Lost Creek, the discharge of the latter being estimated at 11 per cent of the total discharge of the Weber River at the Devil's Slide gauging station.

The radial gate structure and the upper part of the spillway channel lining will be located on earth and the lower part of the spillway channel on conglomerate rock. The gate structure and channel lining will be heavily reinforced throughout and underdrained to prevent the development of uplift pressures. At the lower end of the concrete lined portion of the spillway channel a stilling pool or basin will be provided. The bottom width of the spillway channel is 30 feet and the side slopes 1 to 1. The thickness of the spillway channel lining will be 12 inches on the slopes and 15 inches on the bottom of the stilling pool. The sides of the spillway gate structure will consist of counterforted retaining walls, one side supporting the dam embankment and the other the natural earth.

Provision will be made in the concrete of the radial gate setting for the installation of automatic control apparatus for the two outside radial gates. Float chambers will be formed in the inside piers for the two outside gates and these float chambers connected to the reservoir by means of pipes buried in the concrete floor with intakes at the upstream edges of the spillway approach channel lining.

OUTLET WORKS

Reservoir storage will be discharged through a tunnel in the left abutment and regulated by means of two 60-inch balanced needle valves. These valves will be mounted at the lower end of 72-inch steel pipes which will extend from the needle-valve house at the downstream toe of the dam to the emergency-gate structure in the outlet tunnel under the crest of the dam. In this emergency-gate structure the 72-inch pipes will connect to two 5 by 6 foot high-pressure slide gates which in turn will be connected to a 14-foot diameter concrete-lined pressure tunnel extending to the upstream toe of the dam. At its upstream end the tunnel entrance will be protected by a reinforced concrete

trash-rack structure having a net area of 1,200 square feet or seven and four-tenths times the cross-sectional area of the tunnel. Thus with the maximum capacity of the two 60-inch valves the velocity through the trash racks will be only 1.67 feet per second. Access to the emergency-gate structure from the remote control house on the crest of the dam will be by means of a vertical shaft 6 feet in diameter in which will be installed metal spiral stairs.

The outlet tunnel will serve to by-pass the flow of the river past the dam site during the construction period. With this scheme of river diversion it will be necessary to drive the tunnel, line it with concrete, and build the trash-rack structure before the river is diverted. Various schemes of installing the high-pressure gates in the emergency-gate structures were studied and presented to the contractor. The one finally adopted by the contractor is to drive a by-pass tunnel around the emergency-gate structure so that the gates may be installed as soon as convenient and the outlet tunnel completed early in the construction period except for the installation of the steel pipe. Thus when the dam is completed it will only be necessary to plug the by-pass around the emergency-gate structure, construct the valve house superstructure, and install the 72-inch steel pipes and 60-inch valves to complete the outlet works.

The 60-inch balanced needle valves will be located in a reinforced concrete valve house at the lower end of the outlet tunnel and adjacent to the spillway channel. The valves will discharge into a stilling pool connecting to the stilling pool of the spillway channel.

The maximum discharge of each valve under full reservoir head of 110 feet on the center of the valve is estimated to be between 1,000 and 1,100 second-feet.

The 5 by 6 foot high-pressure emergency slide gates will be operated by oil pressure, and oil pumps and motors in duplicate will be located in the remote control house on the crest of the dam and in the valve operating house at the lower end of the tunnel with high-pressure piping leading from both pump installations to the emergency-gate chamber. Thus the gates may be operated either from the valve house at the downstream toe of the dam or from the remote control house on the crest of the dam.

Entrance to the emergency-gate chamber may be made either through the spiral-stairway shaft from the top of the dam or through the valve house and tunnel along a timber walk to be constructed between the two 72-inch steel pipes.

The tunnel upstream from the emergency-gate structure will be a 14-foot

(Continued on page 137)

Law Notes of Interest to the Reclamation Projects

A State has no power to tax a dealer on gasoline sold by the dealer to the Federal Government

THE case of *Panhandle Oil Co. v. Mississippi*, decided by the Supreme Court of the United States on May 14, 1928, 72 L. ed. (p. 517 of advance sheets of L. ed.), was a suit brought by the State of Mississippi against the appellant, Panhandle Oil Co., for a tax alleged to be due to the State on gasoline sold by the company to the Federal Government for use of its Coast Guard fleet and veterans' hospital.

The supreme court of the State held the tax valid and ordered judgment against the company.

On appeal to the Supreme Court of the United States, the Federal Supreme Court reversed the State court and held the attempted tax void on account of conflict with the Federal Constitution. The opinion of the court was written by Justice Butler, Justices Brandeis and Stone concurring. Justices Holmes and McReynolds filed dissenting opinions.

The opinion of the court is as follows:

Chapter 116 of the Laws of Mississippi of 1922 provided that "any person engaged in the business of distributing gasoline, or retail dealer in gasoline, shall pay for the privilege of engaging in such business an excise tax of 1c (one cent) per gallon upon the sale of gasoline * * *," except that sold in interstate commerce or purchased outside the State and brought in by the consumer for his own use. Chapter 115, Laws of 1924, increased the tax to 3 cents and chapter 119, Laws of 1926, made it 4 cents per gallon. Since some time in 1925 petitioner has been engaged in that business. The State sued to recover taxes claimed on account of sales made by petitioner to the United States for the use of its Coast Guard fleet in service in the Gulf of Mexico and its veterans' hospital at Gulfport. Some of the sales were made while the act of 1924 was in force and some after the rate had been increased by the act of 1926.

Accordingly the demand was for 3 cents a gallon on some and 4 cents on the rest. Petitioner defended on the ground that these statutes, if construed to impose taxes on such sales, are repugnant to the Federal Constitution. The court of first instance sustained that contention and the State appealed. The supreme court held the exaction a valid privilege tax measured by the number of gallons sold, that it was not a tax upon instrumentalities of the Federal Government, and that the United States was not entitled to buy such gasoline without payment of the taxes charged dealers. (147 Miss. 663, 112 So. 584.)

The United States is empowered by the Constitution to maintain and operate the fleet and hospital. (Art. I, sec. 8.) That authorization and laws enacted pursuant thereto are supreme (Art. XI); and, in case of conflict, they control State enactments. The States may not burden or interfere with the exertion of national power or make it a source of revenue or take the funds raised or tax the means used for the performance of Federal functions. (*McCulloch v. Maryland*, 4 Wheat. 316, 425, et seq. 4 L. ed., 579, 606; *Dobbins v. Erie County*, 16 Pet. 435, 448, 10 L. ed. 1022, 1027; *Ohio v. Thomas*, 173 U. S. 276, 43 L. ed. 699, 19 Sup. Ct. Rep. 453; *Choctaw, O. & G. R. Co. v. Harrison*, 235 U. S. 292, 59 L. ed. 234, 35 Sup. Ct. Rep. 27; *Indian Territory Illuminating Oil Co. v. Oklahoma*, 240 U. S. 522, 60 L. ed. 779, 36 Sup. Ct. Rep. 453; *Johnson v. Maryland*, 254 U. S. 51, 65 L. ed. 126, 41 Sup. Ct. Rep. 16; *Clallam County v. United States*, 263 U. S. 341, 344, 68 L. ed. 328, 331, 44 Sup. Ct. Rep. 121; *Northwestern Mut. L. Ins. Co. v. Wisconsin*, 275 U. S. 136, ante, 65, 48 Sup. Ct. Rep. 55; *New Brunswick v. United States*, 275 U. S. —, ante, 104, 48 Sup. Ct. Rep. 20.) The strictness of that rule was emphasized in *Gillespie v. Oklahoma* (257 U. S. 501, 505, 66 L. ed. 338, 340, 42 Sup. Ct. Rep. 171). The right of the United States to make such purchases is derived from the Constitution. The petitioner's right to make sales to the United States

was not given by the State and does not depend on State laws; it results from the authority of the National Government under the Constitution to choose its own means and sources of supply. While Mississippi may impose charges upon petitioner for the privilege of carrying on trade that is subject to the power of the State, it may not lay any tax upon transactions by which the United States secures the things desired for its governmental purposes.

The validity of the taxes claimed is to be determined by the practical effect of enforcement in respect of sales to the Government. (*Wagner v. Covington*, 251 U. S. 95, 102, 64 L. ed. 157, 167, 40 Sup. Ct. Rep. 93.) A charge at the prescribed rate is made on account of every gallon acquired by the United States. It is immaterial that the seller and not the purchaser is required to report and make payment to the State. Sale and purchase constitute a transaction by which the tax is measured and on which the burden rests. The amount of money claimed by the State rises and falls precisely as does the quantity of gasoline so secured by the Government. It depends immediately upon the number of gallons. The necessary operation of these enactments when so construed is directly to retard, impede, and burden the exertion by the United States of its constitutional powers to operate the fleet and hospital. (*McCulloch v. Maryland*, supra, 436, 4 L. ed. 608; *Gillespie v. Oklahoma*, supra, 505, 66 L. ed. 340, 42 Sup. Ct. Rep. 171; *Jaybird Min. Co. v. Weir*, 271 U. S. 609, 613, 70 L. ed. 1112, 1114, 46 Sup. Ct. Rep. 592.) To use the number of gallons sold the United States as a measure of the privilege tax is in substance and legal effect to tax the sale. (*Western U. Teleg. Co. v. Texas*, 105 U. S. 460, 26 L. ed. 1067; *Frick v. Pennsylvania*, 268 U. S. 473, 494, 69 L. ed. 1058, 1064, 42 A. L. R. 316, 45 Sup. Ct. Rep. 603.) And that is to tax the United States—to exact tribute on its transactions and apply the same to the support of the State.

The exactions demanded from petitioner infringe its right to have the constitutional independence of the United States in respect of such purchases remain untrammelled. (*Osborn v. Bank of United States*, 9 Wheat. 738, 867, 6 L. ed. 204, 234; *Western U. Teleg. Co. v. Texas*, supra. Cf. *Terrace v. Thompson*, 263 U. S. 197, 216, 68 L. ed. 255, 274, 44 Sup. Ct. Rep. 14.) Petitioner is not liable for the taxes claimed. Judgment reversed.

This decision will be of importance on many of the projects operated by the Bureau of Reclamation, as it will enable gasoline dealers to quote prices to the Government without including the State tax in the price bid.—*B. E. Stoutemyer, district counsel.*

The type of canal construction in many cases determines the method of delivering water and prevents the use of other and possibly better methods without making expensive changes.

Echo Dam, Salt Lake Basin Project, Utah

(Continued from page 136)

diameter horsehoe section concrete lined. The average thickness of the concrete lining will be 12 inches. This section of the outlet tunnel will always be subject to internal as well as external pressure. The emergency-gate chamber although located in rock has been designed to resist external pressure and will have in addition an elaborate system of drainage between the concrete and rock for the purpose of preventing reservoir pressure. The tunnel below the emergency-gate structure and in which the two 72-inch steel pipes will be mounted will have a system of weep holes on either side to re-

lieve any water pressure. The drains surrounding the emergency-gate structure and the weep holes in the lower section of the tunnel will drain into the tunnel and discharge through the balanced needle-valve house in an 18-inch sewer-pipe drain into the outlet and spillway stilling pool.

The accompanying drawing gives the general plan and sections of the dam and appurtenant works, showing the various types of construction and details of the crest and cut-off walls.

The A. Guthrie Co., of Portland, Oreg., has the contract for the construction of the dam.



Reclamation Project Women and Their Interests

By Mae A. Schnurr, Secretary to the Commissioner and Associate Editor New Reclamation Era



To Readers of this Section

THE writer has just returned from Europe and in the thought that you will be interested will, in the near future, give an account of the trip.

Observations as to the things entering into the effective agricultural development of such outstanding countries as Denmark will be given, as well as a narration of the places of historic note we visited. I hope to have some photographs.

September

One of the finest months in the year in Washington and indeed in all the territory covered by our projects.

As soon as Labor Day is over the children begin to count the days until they return to school. Probably this early training in all of us makes us experience a feeling of seriousness as we look forward to the fall and winter months. We plan things we want to accomplish and there is a sincerity and zest about our plans that we could not possibly create during the warm days of the summer months.

When I was in school I recall that it was just about this time that I would set a

goal far above any I had ever reached before, but it was something to work for.

I still do that, and it is surprising how interesting everything becomes that you do on this basis.

PROJECT BOY AND GIRL

To the school boy and girl we would say take a more active part in all school activities. Success of school programs can only come when each member of the student body is interested and willing to do his or her share.

Most of the projects offer wonderful school facilities.

GROWN-UPS

Planning the return of the boys and girls to school presents all sorts of problems, and to enter genuinely into the

spirit of it the grown-ups should also plan what can be done to assist in their education.

Probably you haven't given the matter any thought, but education and social affiliation are two mighty character builders when properly combined.

The good roads and the automobile defy distance. What was formerly an isolated farm is a homestead with many advantages. Lectures, concerts, fairs, etc., are the means of assisting in the education of the young and keeping alert the minds of the grown-ups.

Do you remember when you were growing up how you loved to do things with others? Live the children's lives with them and see how much richer you will both be as a result. This is one of the points of child psychology that has definitely been recognized as effective.

Correctly Fitted Shoes Essential for Well-being and Health

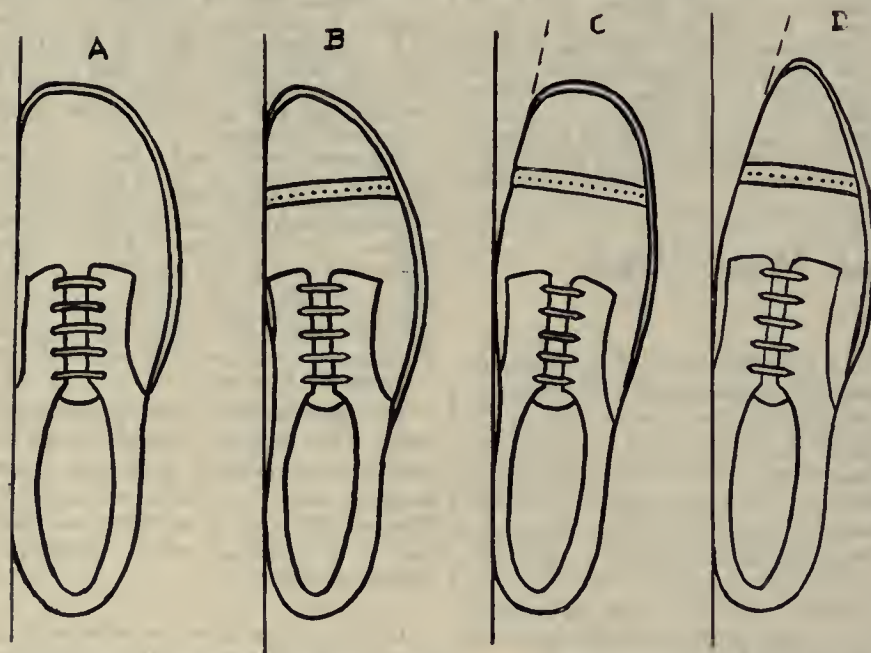
Is anything more tiring and actually painful than to stand all day in shoes that are a misfit?

When you visit a shoe store it is a help to know exactly what sort of shoe you ought to wear, and not to accept any other type. No one but yourself can tell how

your foot feels inside of the shoe you try on. If new shoes are correctly fitted, they will be comfortable from the start. They will not need "breaking in." A good salesman can help you because of his knowledge of his available stock in your size, but you are the final judge of the comfort of the shoe.

Shoes should always be fitted with the entire weight of the body on the feet, as the feet are then at their largest. The "swing" or general direction of the shoe should be the same as that of the foot. It should not tend to twist the foot out of its normal position. The illustration shows shoes of correct and incorrect lines. Correct shoes have a straight inner line and rounded toe characteristic of the normal foot. Toes that slope away from this naturally straight inner line, and toes that are too pointed, are certain to distort the foot. The one-sided appearance of a worn shoe is usually due to an incorrect swing, which has caused the ball of the foot to rest at one side of the shoe, rather than straight in the middle.

Shoes that fit correctly permit standing, walking, and quick turning in comfort and safety. A normal erect position of the body can be kept in such shoes without undue strain or discomfort. The feet, while snugly supported, are not cramped or crowded, and a firm, full tread is possible. Much depends also on the height



Shoes made on proper and improper lines. A and B satisfactory. Note the straight inner line and rounded toe. C and D objectionable. Note the curve outward from the naturally straight line of the foot; also the too pointed toe in D



These shoes seemed beyond repair, but—

They were made to look like this

and shape of the heels, which should be moderate, and nearly as broad throughout as the heel seat of the shoe, tapering but little.

Many shoes are too small for the wearer. This is an especially serious fault when they are too short. During wearing a shoe may spread, but it will not become longer. There should be a good half-inch of empty space beyond the toes in a broad or well-rounded shoe. In more pointed shoes there should be more space.

Shoes that are too large are also a misfit. With too much play in the shoe the foot is not snugly supported. Blisters are often formed, especially on the heel, by the rubbing of the foot against the inside of a shoe that is too large. Incidentally, neglect of foot blisters may result in serious infection.

Aside from any consideration of health and comfort, shoes for young and old alike are easier on the family budget if of correct design and fit. Such shoes do not soon lose their original attractiveness and shape and they wear longer.

REPAIR SHOES PROMPTLY

Good care of shoes includes prompt repair. It is never true economy to wear down-at-the-heel, dilapidated shoes. Such shoes neither protect the feet nor properly support the body. What might be saved in leather may be paid eventually to foot specialists and doctors. The minute a seam begins to rip, the upper cracks through, a heel twists out of shape or runs down, or a hole wears through the outsole, the shoe needs mending. If the necessary bit of repairing is put off, the shoe may be so badly worn that it is no longer worth mending, and from \$2 to \$5 will be lost by neglect. This is particularly true if the welt is worn away or the insole is worn through.

Heels should always be kept "squared up." When they begin to run down on

one side both the shoes and the body are put under a strain. The shoes are soon permanently twisted out of their normal position and shape, and the feet, ankles, and legs may be twisted also. Unless the leather or rubber list on wooden heels is promptly replaced when it wears away the covering of the wooden part is cut through and may have to be replaced, sometimes an expensive job because of the difficulty in matching the material in the rest of the shoe.

Ripped seams in the uppers can frequently be stitched at home. A handy

person, with the aid of a repair kit, can put on new heel lifts, rubber heels, half soles, and metal heel or toe plates without much difficulty.

The equipment necessary for repairing shoes includes a last holder, three or four iron lasts of different sizes, a shoemaker's hammer, a pair of pinchers, one or two leather knives, a leather rasp or file, awls, nails for soles and heels, flax shoe thread, bristles, and wax. These articles or made-up repair kits are sold by dealers in hardware or shoe findings and by some mail-order houses.

Making Reclamation a Success

ONE of the most constructive editorials among the many which have been written discussing the problems of reclamation appeared in a recent issue of *Sunset Magazine*, in which the editor points out that the most expensive way of putting Federal irrigated land into the hands of competent, qualified settlers often is the cheapest in the long run. His theme is that it would pay the Government to conduct an intelligent high-power selling campaign even if the cost should reach 20 or 25 per cent of the selling price, on the ground that the sooner the land is made fully productive the cheaper it will be in the long run. However, he hastens to add that such a sales campaign would end in disaster unless the Government carries out the following program:

"Select buyers who are really qualified by experience and temperament to make a success of the venture.

"Reject prospective buyers unless they have sufficient money to get a good start.

"Sell the land to the selected settlers at a reasonable price and spread the payments over a long term of years.

"Make loans for improvements to the settlers, these loans also to be repayable over a long term.

"Supply expert advice and guidance to direct the productive efforts of the settlers into the right channels.

"Organize the settlers for cooperative buying and selling.

"Thereafter make the settlers stand strictly on their own feet and meet their obligations without a political shoulder to weep on.

"That, in substance, is the program recommended by a conference of reclamation and colonization authorities. It is a good program. It will work—provided somebody will put up enough money to start it going and provided the right man is found to carry it out. It takes money, brains, and experience to make this program work, and of these three the last two are just as important as the first."

The field of irrigation management during the present century has broadened more and more as numerous enterprises have been brought from the construction to the operation stage.

Secondary Project Investigations

By E. B. Debler, Hydrographic Engineer, Denver Office

FUNDS for investigation of secondary projects become available from Federal appropriations and through contributions by States, associations, or individuals for expenditure by the United States. Where funds from other sources than Federal appropriations are used, contracts must be entered into between the United States and such parties covering the scope and mode of operations for the proposed work and providing for final report, and such contract must be executed for the United States prior to expenditure of funds. As a general rule, contributed funds are provided on a 50-50 basis, and it is desirable that the contributed funds be deposited materially in advance of the time they are to be used. Appropriations lapse at the end of the fiscal year for which they are made and can be expended thereafter only to the extent that they have been encumbered by contracts entered into before the end of such fiscal year.

SUPERVISION

All engineering investigations are under the direct supervision of the chief engineer at Denver, and all agricultural and economic investigations and soil surveys are under the direct supervision of the director of reclamation economics at Washington. The office supervising the work must at all times be kept fully advised of developments and of any changes in plans that become advisable or desirable, in order that all phases of the work will be completed with available funds.

AUTHORIZATION, ALLOTMENTS, AND ESTIMATES

Upon receipt of advice that a proposed investigation is authorized either through the execution of a cooperative contract or pursuant to legislation and appropriation, an allotment advice (Form 7-680) will be prepared in the supervising office and submitted to the commissioner for approval. Upon approval thereof the engineer or economist who has been selected to make the investigation will be advised of funds available and of the scope of the investigation, so that he may prepare his program and submit estimate and authority for the work for approval.

ACCOUNTING AND COST KEEPING

Separate fund and cost accounts for each investigation are maintained in the Denver office, and monthly statements thereof will keep field men advised of the status of the available funds at the end of each month.

All items connected with the expenditure such as time books, invoices, vouchers, transfers, memorandum copies of transportation requests, etc., should be forwarded promptly to the Denver office for payment and entry. At the Denver office accounts for secondary projects are closed on or before the 12th of the month, and it is necessary that all items of cost incurred during a previous month be received prior to that date in order to insure correct cost reports.

Prior to approval of a project for construction and appropriation therefor, all costs are charged to examination and surveys.

The costs are distributed to the classes of work under investigation such as reconnaissance, hydrography, topography, canal location, soil surveys, drilling, estimates, etc. Sufficient information and recap should accompany each time book, invoice, or voucher sent for payment to permit proper classification of costs incurred. Unit quantities of work accomplished each month and to date, such as acres of topography or soil surveys, miles of canal location, linear feet of drilling, etc., should be given each month so that unit costs of the work may be available.

Investment in equipment is carried in a general account for this purpose and each investigation is charged with accrued depreciation each month. With completion of such investigation a revaluation is made of equipment returned and accounts for the investigation are adjusted to carry the actual net aggregate depreciation and loss.

FIELD PURCHASES

The prices of many articles in general use by Government activities, and on which the retail price is fixed by the manufacturer, such as automobile parts or tires, are fixed in general contracts by the Government with the manufacturer, and no higher price may, except in emergency, be paid therefor. Stationery, office equipment, engineering supplies, and equipment must be procured by transfer or through the Denver office. In general, field purchases should be limited to items of small cost not in general use, and on which transportation from other points would not be justified.

Cash payments in the field must be limited to unavoidable procurement of the needed service or materials when direct payment through the Denver or other office is impractical, and a very strict observance of this rule must be exercised.

When on travel status, expense accounts must show the time of leaving and arrival for each trip, and except for personal service to the payee must carry a full description of items to be paid with receipted subvoucher or statement on the firm's letterhead. All travel must be authorized and covered by appropriate travel order.

PERSONNEL

Assignment of employees in positions such as clerks, appraisers, engineering and economic aides, etc., will be made through the supervising office. Engineers and economists in charge of work are authorized to employ laborers or other persons for unclassified and registered noneducational positions. Suitable memorandum of employment must be submitted on card Form 7-808 for laborers and other unclassified positions, and on card Form 7-807 for registered positions. The rate of pay may not exceed rates shown on the approved organization sheet.

New employments in positions subject to field classification must be at the minimum rate for the grades to which the position has been allocated, unless prior approval shall be secured from the department to do otherwise. Job classification sheets on personnel classification board Form No. 4 must be submitted to the supervising office in triplicate in connection with all new positions subject to field classification. Civil Service Commission's Form 2290 should be filled out and forwarded to the supervising office in connection with all new employments in registered positions.

All personnel papers, including memorandum of employment and civil-service records, must be forwarded to the supervising office for record.

SALARIES AND WAGES

Payment for service earnings and travel expenses will be made by the supervising office. Promptly at the end of each month time book (Form 7-812) showing the name, pay-roll designation, rate of pay, period of employment, amount earned, deductions, if any, and amount due, in the case of each employee, must be forwarded for vouchering and payment. In order that appropriate civil-service reports may be prepared in the Denver office, pencil notation should be made in each time book submitted showing any change in status, such as new employment, changes in designation, change in salary, termination of appointment, etc., during the month.

MONTHLY REPORTS

At the end of each month the engineer or economist, or some one designated by him, will prepare a monthly report of work accomplished, forwarding the original and one duplicate to the chief engineer and copy to others interested. This information is combined in a general monthly report on secondary investigations to the commissioner, which is forwarded from the Denver office on or before the 7th of each month to the Washington office. It is only through the receipt of such monthly reports that the commissioner and supervising offices can keep in close touch with the work that is going on in the field on secondary investigations. The field monthly reports should include statements on—

- (a) Work accomplished.
- (b) Proposed work for the following month.
- (c) Personnel employed.
- (d) Annual leave taken, in the aggregate.
- (e) Expenditures by the field forces during the past month, and estimated expenditure for the following month.
- (f) Report of auto mileage.
- (g) Diamond drill carbon depreciation or loss and other special reports required for cost-keeping purposes.
- (h) List of visitors.
- (i) Miscellaneous matters of interest.

ASSUMPTIONS AND ESTIMATES USED IN REPORTS

As the final report by the engineer or economist in charge must be approved by the supervising office and by the commissioner before being released for public inspection, the proposed unit costs used in estimates, structure designs, typical canal sections, canal capacities, duty of water, bases of land and soil classification, cropping plans and other important features, should be submitted to the supervising office for approval as early in the course of the investigation as possible, in order that the report may not have to be revised and rewritten before it can be recommended for approval. Very often such points have an important, if not controlling, influence in directing the trend of the investigation. If the report is prepared in rough draft, copy thereof should be submitted to the Denver office for review prior to final typing.

FINAL REPORT

The report should be typed in six to eight copies depending on the extent to which it may prove desirable to distribute copies thereof. Thin opaque but not onion skin paper should be used with ample margins, particularly on the binding edge. Typing should be double spaced. Standard report covers can be furnished

by the supervising office. All original maps and drawings used in reports should be provided with a filing number before being printed. In the case of such material to be filed in the supervising offices, a project number will be furnished by such office upon request. Photographic films will be filed for record in the Washington office.

The report should consist of a letter of transmittal to the chief engineer or director of reclamation economics by the engineer or economist in charge of the work, followed by a brief synopsis of the matters covered by the report, this in turn to be followed by a table of contents and the body of the report. Where the synopsis can be written in one or two pages it should be included in the letter of transmittal. The report should contain only sufficient general drawings, maps, and plans to permit a full understanding of the material discussed therein, but should not include, as a rule, detailed designs, plans, or lengthy computations. When it becomes necessary to include in the report voluminous maps, computations, and tabulations, these should be bound in a separate volume. Computation sheets, plans, and maps and other matter not placed in the report should be bound in a good cover and filed in the Denver office for future reference. While reports need not contain abstract treatises on water supply, engineering principles and design, drainage, economics, or agricultural problems, care must be taken to present at least the more important data underlying the various assumptions, estimates, and conclusions. Where important matters from other reports are utilized, reference thereto is advisable. Recommendations

bearing on matters of policy or tending to commit the department to a course of action looking toward construction must be avoided.

PUBLIC RELATIONS

While everyone interested in the investigations under way should be given opportunity to make suggestions thereon and be, in general, informed of the work under way, no part of the report should be furnished to outside parties without prior consent of the supervising office, until the report has been approved and release authorized by the commissioner.

RECORDS

Upon completion of the investigation all field correspondence files, computation books, field books, detail maps, tracings, designs, drill cores, etc., will be sent to the Denver office or to a near-by project office in accordance with instructions in regard thereto in each particular case. Copies should be made and retained of maps, data, and reports borrowed from other agencies and used in the course of the investigation. Data loaned by other agencies should be acknowledged upon receipt thereof and returned as promptly as possible.

EXCAVATION for the right and left abutments of Easton Dam, Kittitas division, Yakima project, was about 90 per cent completed at the end of the month. Work was in progress on the excavation for the fishway and the erection of a concrete plant. Construction of the earth dike north of the dam has been completed.



Irrigated potatoes on a reclamation project

Proposed Reclamation of Paradise Valley, Arizona

AN agreement was signed recently at the Department of the Interior which brings to an end a controversy that has lasted 20 years and makes possible the reclamation of Paradise Valley in Arizona, a desert area that has lacked only water to make it luxuriantly productive, and the production of considerable electric power.

The agreement was between the Salt River Valley Water Users' Association, the Verde River irrigation and power district, and the United States Government. It had to do with the distribution of the waters of the Verde River, a torrential stream of considerable flow which comes out of the mountains and pours itself into the desert and, at flood time, through the Salt, Gila, and Colorado Rivers into the Gulf of California.

The waters of the Verde River were first used in Salt River Valley around the town of Phoenix. That district admittedly had the prior right to the normal flow of the river. Its main source of water supply is from Roosevelt Reservoir, on Salt River, the Government's prize reclamation project. But the Verde flows into the Salt River below Roosevelt Dam and supplements the supply.

Under the document it is agreed that the flow of the Verde River that is necessary to supply the water to which Salt River Valley is entitled shall be maintained. The Paradise Valley people, however, may bond themselves or otherwise procure money and dam the Verde, thereby establishing a storage reservoir. They may use for irrigating their own lands the water thus made available in

addition to that to which the Salt River Valley is entitled. Thus stopping and storing the flood waters of the Verde will provide considerable amounts of irrigation water. The land to which it may be carried by gravity canals is ideal for reclamation. It is immediately adjacent to that of Salt River Valley which has already proven its ability to produce under irrigation almost unbelievable returns. Salt River Valley is orange and grape fruit land and rushes many trainloads of early vegetables to the eastern market every year.

The present contract does not provide for the actual development of the area but merely lays the basis for it. The first task is to ascertain the amounts of water available for storage and the amount of land that it will reclaim. The Government will be a party to this determination. Its Geological Survey has the record by actual measurement of the water that has flowed down the Verde for decades past. The Bureau of Reclamation has the record of the amounts needed to irrigate given acreages in this region. With a known amount of water the area to be reclaimed will be laid out. Some 80,000 acres are available. One view is that all of this may be reclaimed. Another is that there is not water for more than 40,000 acres. When the facts are definitely determined the lands to be reclaimed will be placed in an irrigation district and the water can be used only in that district. The lands outside it will be left to greasewood and cactus.

The Government's interest in this area is increased by the fact that there are two

Indian reservations in it and that water will be made available to Indian lands included in them.

After all the points at issue are determined the development of this land and power will not become a Government project. Private capital will build the dam, the power plants and canals, and control the project from the beginning. The Roosevelt Reservoir and the Salt River Valley reclamation were carried on directly by the Government and the money spent is being refunded by the land that was benefited. The project is managed by a "water users' association." That association is prosperous and has entered into various projects such as that of building two additional dams for the development of additional electric power. The power generated is now more than carrying the operating expense of the entire project. The surplus revenues are being applied to the reduction of the construction cost, resulting eventually in the benefits of water irrigation being without cost. Since the new development is so interwoven with the Salt River Valley project it has been proposed that it merge itself with the older undertaking and this may be brought about. Whatever the method the present agreement promises to lead to the actual development of another great water storage project in the West and to the conversion of another desert area into a region of intense productiveness.

AT the middle of the month approximately three-quarters of a million dollars had been paid out by sugar-beet growers in the North Platte Valley for hand labor on the crop. Men and women working in the fields were paid \$10.50 per acre on approximately 75,000 acres for blocking, thinning, and hoeing the largest acreage of beets ever grown in the valley.



Construction progress on Gibson Dam, Sun River project; Montana

Project Repayments Show Gratifying Gain

Settlers under the reclamation projects of the Government did better on repayment of the charges against their lands last year than ever before. They paid into the Treasury on this account \$4,903,000, as compared to \$3,719,000 the year previous. Thus the payments for the 1928 fiscal year exceeded those of 1927 by \$1,184,000, or more than 30 per cent.

This marked increase in repayments is attributed to two causes. The first of these is the fact that there is general prosperity on the reclamation projects and that money for repayments is consequently available. The second is the fact that there has been a general readjustment of the financial relations between the Government and the reclamation project settlers, and that the new paying bases established for delinquents are such as to make satisfactory returns possible.

It should be borne in mind that the Bureau of Reclamation has a revolving fund of about \$166,000,000 invested in reclamation projects. The money so invested ultimately will be returned to that fund by those who are benefited. When it is returned it is then available for use in developing new projects. These are the returns that increased so greatly last year. Money received by the Government from the sale of public lands amounting to some \$500,000 a year goes into the reclamation fund. Moneys received as royalties from oil leases also go into this fund. About \$4,000,000 a year is now received from this source. The combined revenues received from all sources, and put into the development of reclamation projects will this year amount to about \$15,000,000. All the money is from established sources of income and called for no appropriation from the Treasury. Naturally an increase in revenues of more than \$1,000,000 from repayment sources is of material importance to the bureau. It furnishes one of the reasons why the construction program is greater this year than ever before.

There are at present 24 operating projects presided over by the Bureau of Reclamation. The financial status of these is such that 22 of them are now making regular repayments to the Government of the money advanced to them. There are but two completed projects that have not yet reached a repayment status.

Every encouragement should be given to the production and marketing of better eggs.

Irrigation in Japan

By Dr. Toshi Ohasht, Chief Expert, Soil Reclamation Bureau, Hokkaido Government, Sapporo, Japan

IRRIGATION in Japan is applied only to rice, as all other crops need practically no irrigation because of the abundant rainfall.

The cultivated area of Japan is 29,000,000 acres, of which more than 13,000,000 acres are cultivated by irrigation (rice field). The cultivated acreage of Hokkaido is now about 2,100,000 acres, of which 375,000 acres are planted in rice. The common methods of irrigation in Hokkaido are by means of natural streams or by water reserved for the purpose. Lately pumps are being installed for pumping water on the required lands, but the method is not as yet in popular use because of the expense. The protective policy of Japan with reference to soil reclamation in Hokkaido is as follows:

FINANCIAL AID TO SETTLERS

For all irrigation systems on farms of 2.5 acres or more the Government bears one-half of the expense. The Government subsidizes farming in Hokkaido by bearing 40 per cent of the expenses of the first preparation for rice fields. Irrigation of farms of more than 250 acres is usually conducted by corporations, but smaller farms are worked by individuals.

Project Water Supply

The month of July was generally very favorable for rapid crop growth. hot weather being prevalent except on Montana projects. Rainfall was abnormal, except on far western projects, on the Montana projects largely obviating the need for irrigation. Heavy rains and hail damaged crops on the North Platte, Elk River, and Sun River projects. Frosts occurred on the Klamath project.

Stream flow was augmented by unusual rains. Storage on hand is equal to or in excess of seasonal requirements, except on the Orland and Okanogan projects. On the Orland project the supply is sufficient with careful use to prevent material reduction in crop production. At Okanogan the supply will be sufficient to produce a good crop and although less than a complete supply, will be better than for a number of years past.

For the same reservoirs, the storage on hand on July 31, 1928, was 6,706,000 acre-feet, compared with 7,343,000 acre-feet on the same date in 1927.

Credit is being extended to these corporations and farmers by the Hokkaido Colonial Bank. The Government also extends credit through this bank at the rate of 5.4 per cent to the corporations, but not to individuals. The rate of interest charged by the colonial bank is 7.9 per cent. The Government and colonial bank both extend credit to about the same amounts to the irrigation corporations.

We have peat soil in Japan, found only in Hokkaido. The total acreage of peat soil there is 625,000 acres, of which about one-third is devoted to agriculture. The peat soil in Hokkaido belongs partially to the Hochmoor and Niedermoortypes. That related to the Ubergangmoor is rare. Peat soils are distributed in the lower parts of the rivers and some along the seashore. Wherever possible, irrigation is used for the rice crop grown in peat soil, but where irrigation is not possible we have crops such as rape seed, oats, buckwheat, and potatoes.

The protective policy in regard to drainage in Hokkaido is that the Government shall dig main ditches for every 1,250 acres. For the main ditches in fields of under 1,250 acres and for all branch ditches the Government bears one-half of the expense. For the soil-mixing systems in peat soil on farms of about one acre or more the Government bears also one-half of the expense. The Government subsidy of agriculture will not be made a second time should the necessity arise.

Okanogan Apple Crop Promises Big Returns

A recent issue of the Omak Chronicle, Okanogan project, Washington, states that an increase of approximately 50 per cent in this year's apple crop at Omak over that of last year has been predicted by the State's horticultural inspectors. Many growers are inclined to believe that this estimate is entirely too conservative and that the crop will run 75 to 80 per cent greater.

"With the project on a new financial basis and ample water in sight and the best crop in several years on the trees, it seems that the agricultural outlook here is decidedly promising. Omak's apple crop was worth approximately \$1,250,000 last year. This year will see it making steadily toward the \$2,000,000 mark."

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, left the Washington office on August 10 for an extended trip of inspection over a number of the reclamation projects. He expects to be away for several weeks, during which time P. W. Dent will be acting commissioner.

R. F. Walter, chief engineer, in company with J. L. Savage, chief designing engineer, spent the entire month on an extended inspection trip by automobile, visiting the Orland, Klamath, Yakima, Umatilla, Vale, Owyhee, Minidoka, Boise, and Sun River projects.

Walter H. Olin, agricultural commissioner of the Denver & Rio Grande Western Railroad, and G. S. Kelch, general agent of the American Refrigerator Transit Co., visited the Denver office recently in connection with the settlement of the Grand Valley project.

A. Morrison, of the Water Conservation and Irrigation Commission, of Sidney, New South Wales, Australia, has been investigating methods of the bureau, with particular reference to hydrographic work.

I. E. Houk, engineer in the Denver office attended a meeting in Los Angeles of the Engineering Foundation Arch Dam Committee, and also inspected the uplift pressure pipes installed in the American Falls Dam.

David I. Walsh has resigned his position in the drafting division of the Washington office to accept a position as associate topographic draftsman in the aeronautic division of the Department of Commerce.

R. B. Dame, former photographer in the Bureau of Reclamation, has been employed temporarily in the Washington office to identify, classify, and card index the old motion-picture negatives in the files of the bureau.

Recent visitors at the Owyhee dam site included Dr. Elwood Mead, Commissioner of Reclamation; Gov. H. C. Baldridge, of Idaho; Joel Priest, general agent of the Oregon Short Line Railway; E. C. Van Petten, of Ontario; and F. T. Crowe, former superintendent of construction.

George W. Boschke, chief engineer of the Southern Pacific Railroad, and William Worden, right-of-way agent, conferred recently with Superintendent Newell, of the Klamath project, relative to the crossing of project canals and drains by the proposed Modoc Northern Railway.

George P. Taylor, clerk on the Klamath project, has resigned, his position being filled by the transfer of Ben G. Sucher, former timekeeper on the Grand Valley project.

Ernest Hopkins, chief editorial writer for the San Francisco Examiner, who is touring the Sacramento Valley, spent a day recently at Orland inspecting the project and collecting data for two articles, which appeared in subsequent issues of the paper.

Recent visitors on the Orland project included John D. Coffman and W. F. Derby, of the California National Forest, and M. A. Peck and F. C. Tatton, of the industrial department of the Southern Pacific Co.

An inspection trip to American Falls Dam was made recently by Commissioner Mead, accompanied by Senators Borah and Thomas, Representative Addison T. Smith, District Counsel Stoutemyer, B. E. Hayden, reclamation economist, R. E. Shepherd, and Joel Priest and R. A. Smith, of the Union Pacific.

H. F. Gonnerman, manager, and Ray Wilson, associate chemist, of the Portland Cement Association Laboratory at Chicago, and W. H. Richardson, of the Portland Cement Association at Salt Lake City, spent several days on the Uncompahgre project inspecting the concrete blocks at the North Mesa siphon bed. About 1,000 concrete blocks were

built in 1921 of various compounds and mixtures by this association and placed in this seep bed for the purpose of developing some compound or mixture that would withstand the action of alkali on concrete.

H. E. Sealing has resigned as senior draftsman on the Yakima project, where he has been employed since March 28, 1925.

B. F. Holmes, member since its inception of the board of directors of the Truckee-Carson irrigation district, Newlands project, has resigned from the board and gone to California to live.

County Agent H. L. Lantz and L. E. Edwards, from the Milk River project, visited the Shoshone project recently to study methods of obtaining settlers for the Willwood division.

Recent visitors at Echo dam site, Salt Lake Basin project, included A. P. Bigelow, president, E. P. Ellison, vice president, J. D. Hooper, secretary, and the board of directors of the Weber River Water Users' Association.

Recent additions to the force on the Riverton project include W. F. Kemp, associate engineer, transferred from the lower Yellowstone project, and Erle W. Shepard, chief clerk, transferred from the Newlands project.

During July 1926 visitors were shown through Elephant Butte Dam by the reservoir superintendent.

Bryan W. Steele, engineer in the Denver office, spent several days on the Carlsbad project in connection with plans for raising Avalon Dam.

Roger R. Robertson, assistant engineer, has been transferred from Stony Gorge Dam, Orland project, to the Lower Yellowstone project, where he will have charge of drainage construction, succeeding W. F. Kemp, associate engineer, transferred to the Riverton project.

A delegation of 25 fruit and potato growers from Montana, guests of the Ellensburg Chamber of Commerce, inspected the Kittitas division of the Yakima project recently.

Victor M. Mosseri

1875-1928

Doctor Mead recently received word of the death on July 20, 1928, of Victor M. Mosseri, a distinguished Egyptian engineer, officer of the Legion of Honor, president of the Institute of Egypt, and corresponding member of the Academy of Agriculture of France. Mr. Mosseri was joint author with Sir William Willcocks of "Drainage of Lower Egypt."

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kubach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wildo Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C.
A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....	.....	Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Oblesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	.....	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....	C. C. Cragin.....	.....	.....	.....	.....
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹⁴	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹⁵	C. B. Funk.....	.....	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Denver, Colo.....	.....	Middle Rio Grande conservancy district.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	State of Utah.
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	.....
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	.....



HORSE MESA DAM AND POWER HOUSE, SALT RIVER PROJECT, ARIZONA

NEW RECLAMATION ERA

VOL. 19

OCTOBER, 1928

NO. 10



THE HARVEST

I HAVE just returned from a most instructive trip to the West, during which I visited a number of the projects of various sorts that are administered by the Department of the Interior. Those projects include those of Indian administration which could be well seen on the Blackfoot Reservation in Montana, which we carefully inspected. We went through Glacier National Park and studied the method of handling these recreational areas. I was met by the officials of Yellowstone Park which I had previously visited and the situation there was discussed. We visited practically all of the reclamation projects of Montana and Wyoming. We went to Casper, Wyo., and looked over the oil fields there.

These visits were made specially valuable by the fact that we were everywhere accompanied by Members of Congress and specialists most interested in the problems in hand. Representative Cramton, of Michigan, chairman of the House Committee on Appropriations, for the Department of the Interior, was a member of our party. Representative Leavitt, of Montana, showed us his State. Representative French, of Idaho, joined us. Senators Warren and Kendrick, and Representative Winter, of Wyoming, were with our party throughout their State. Doctor Mead, head of the Bureau of Reclamation, went along. Everywhere we talked with the settlers themselves, with local business men, members of chambers of commerce.

We were much impressed with the development of these reclamation projects. Theirs is a class of farming that is peculiar. The consensus of experts' opinion seems to be that the great need with them is diversification. The crops that they should raise are largely those which are noncompetitive with the farmer who lives further to the east. Their advantage in growing sugar beets is admitted. They produce excellent fruit. Alfalfa and sweet clover thrive under irrigation. These lead logically to dairying. Butter and cheese lend themselves to shipment for long distances. Sheep for food and wool graze on the hills and may be fattened on alfalfa. Much beef can be produced here. The opportunity for poultry raising in these western dry regions is unsurpassed. The turkey is a delicate bird to which bad weather is likely to prove fatal. In these dry areas they thrive as nowhere else and their production has become an important industry. Eggs and poultry may be shipped long distances. It is in such products that the reclamation projects seem to have their best opportunity.

*ROY O. WEST,
Secretary of the Interior.*

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

ROY O. WEST
Secretary of the Interior

Price, 75 cents a year

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

October, 1928

No. 10

Interesting High Lights on the Federal Reclamation Projects

THE Yuma Chamber of Commerce, Yuma project, awarded \$1,000 in prizes to the successful contestants in the National Air Races landing at Fly Field.

THE directors of the Orland Unit Water Users' Association are planning to hold dedication ceremonies on October 26 in connection with the completion of Stony Gorge Dam. Final closure of the dam has been made and the entire flow of Stony Creek is now passing through the needle-valve outlets.

AN excursion to Salt Lake City was arranged recently by poultrymen on the Grand Valley project in order to visit the poultry plants in that vicinity.

EFFORTS are being made by representatives of one of the large paper mills of Wisconsin to obtain a suitable site at Montrose, Uncompahgre project, for the location of a barking plant. It is planned to ship spruce logs to Montrose from the Lizard Head section of the San Juan Mountains, remove the bark from the logs, and then ship them to Wisconsin to be ground into paper pulp.

THE Butte County Fair, held recently at Nisland, Belle Fourche project, contained a fine display of irrigated products and livestock. Nine women's clubs competed in the community booths. Horse Creek was first and Newell second, both on the project.

THE Chicago & Northwestern Railway Co. is building 6,000 feet of new track in the Belle Fourche yards, Belle Fourche project, to handle the increased shipments from new industries in that vicinity. A wholesale company is doubling its plant to provide 15,000 square feet of floor space. A new school building to cost \$40,000 is being erected at Nisland.

A SURVEY is being made by the Forest Service and the Boise Payette Lumber Co. to determine whether a practicable railroad line can be constructed from Idaho City into the timberlands on Crooked River, a tributary of the North Fork of the Boise River. If the road proves feasible it is the plan of the lumber company to make extensive purchases on Crooked River and cut the timber there. This has caused considerable apprehension among the Boise project water users, who feel that a denudation of the watershed will reduce the runoff or at least cause the flood stage to come earlier.

A RECORD yield of alsike clover seed was produced by Guy A. Weller, near Paul, Minidoka project. Seven acres produced 7,040 pounds of seed which sold for 22 cents a pound.

SETTLERS in the vicinity of Rupert, Minidoka project, are considering plans for the establishment of a potato alcohol plant.

THE potato growers association on the Milk River project entertained representatives of the State Agricultural College, the Great Northern Railway, and southern potato growers on a recent inspection of the seed potato fields of the project. Tentative arrangements were made for the disposal of a considerable amount of the product at a favorable price.

WORK at Echo Dam, Salt Lake Basin project, during the month comprised partial excavation of the core trench, placing gravel and cobbles in the dam, placing concrete in the corewall, stripping the dam site, excavation and placing of concrete in the floor of the trash rack, placing concrete in the tunnel lining, rock excavation in the spillway, and team stripping for borrow pits. Based on gross contract earnings the dam was 17.4 per cent completed at the end of the month.

AT Gibson Dam, Sun River project, 19,600 cubic yards of concrete were poured during the month, bringing the total to 101,000 cubic yards, with 59,000 cubic yards remaining to be placed. Work had begun on placing concrete lining in the spillway tunnel.

THE contractors for the first 12 miles of the Modoc Northern Railroad, running through the Klamath project, expect to complete the grade for this section early in October.

SENTIMENT is crystallizing for the formation of a well-organized turkey-marketing association for western Nevada. The Fallon Turkey Growers' Association, Newlands project, through their efforts last year, received the highest prices paid for turkeys in the State. This has created considerable interest in cooperative marketing in other districts. The experience of the Fallon association will be of great help in organizing a western Nevada association.

HONEY producers of the North Platte Valley have organized a cooperative marketing association. Beekeeping is becoming one of the important branches of activity, and it is expected that several cars of honey will be shipped from the valley this year. One apiary located at Morrill, on the North Platte project, has about 1,200 stands of bees.

A NEW bean warehouse 32 by 150 feet in size is to be erected shortly at Morrill, Nebr., on the North Platte project.

THE opening of the Montrose Airport, Uncompahgre project, was formally celebrated on September 11, 1928. The airport is on Sunset Mesa, 1 mile southwest of Montrose and on a direct route for air flights between Pueblo and Salt Lake City.

Settlement and Development Problems, Sun River Project, Montana

By Geo. O. Sanford, Project Superintendent

SUN River project is located in north central Montana about 40 miles east of the Rocky Mountains and 100 miles south of the international boundary. The Fort Shaw division, which has an area of about 14,000 acres of river bottom and adjacent bench lands, was opened to entry in 1908 and all farms have been homesteaded. An irrigation district has been formed, and this organization is now operating the canal system and promptly meeting its payments to the United States. The principal portion of the project is located on the north side of Sun River and comprises an area of about 93,000 acres of bench land which is highly productive and well suited to irrigated farming. The land was withdrawn under the reclamation act in 1903, but prior to that time about 12,000 acres had been entered and are now patented; 13,000 acres are covered by desert-land entry, the title to which is to be perfected by the purchase of water from the Government canal system. About 27,000 acres were homesteaded subject to the provisions of the reclamation act, leaving 34,000 acres of unentered public land and 7,000 acres of State land, of which 2,200 acres have been sold.

The construction of the canal system for the irrigation of this area was started in 1913 and works have been completed for the irrigation of 42,000 acres at a cost of about \$4,000,000. As the low-water flow of Sun River has been taken by private appropriators, the rights of the Government are limited to the flood flow which occurs during the months of May, June, and early July. This flood water has been delivered on a rental basis since

1920. Wheat has been, and still is, the principal crop and in 1927 comprised two-thirds of the 29,000 acres in cultivation. The average yield was 14 bushels and the value \$13.30 per acre. Most of this crop was produced without irrigation, as the rainfall was 7 inches above the annual precipitation of 11 inches. This low average yield, to an extent of possibly 5 bushels per acre, is due to damage by hail, but it is nevertheless a self-evident fact that no project can expect to pay out on wheat—in fact, this return does not cover the cost of production on an extensive dry-land farming scale, and the cost under irrigation will run from \$2 to \$3 more per acre.

In 1925 an irrigation district embracing all of the north side land was created under the provisions of State law, and the following year a contract was executed with the Secretary of the Interior, which, among other things, provides that the United States will complete the project and the district return the construction cost, the annual instalments being 5 per cent of the average acre income for the 10 years last past. The confirmation of this contract cleared the way for the appropriation of funds for the construction of storage works which will insure an adequate water supply for all of the irrigable lands. Gibson Dam and Reservoir, now under construction, will be completed in time to store water for the season of 1929. The 10-year program as approved by the Secretary contemplates no additional construction until the fiscal year 1935, which should give ample time for the development of that portion of the project now under completed works. The essence of

this paper is the presentation of detail plans covering the change from extensive wheat farming to intensive irrigation farming, to the end that the return per farm may be sufficient to support a family in comfort and pay construction and operation costs.

OPERATIONS ON GREENFIELDS DIVISION

In 1927 there were 180 persons carrying on the farming operations on the Greenfields division and of this number 48 were operating farms as renters; 35 owners were operating their own farms and renting other lands, leaving 97 owners who were operating the farm they owned. Of the 48 straight renters 3 have contracted to purchase farms and it is estimated that at least 15 more will close deals as soon as they can make some initial payment. There is need for about 200 more farmers to work the lands that have thus far been homesteaded and when public notice issues there will be 80 more farms opened to entry. The question as to how and where these additional settlers are to be secured is one not easily answered. Two private projects in this section of Montana are making strenuous efforts to bring in new settlers and have been given valuable assistance by the settlement agents of the railway companies, but the results have not been all that could be desired. Although there are no large holdings under the completed portion of the project that will have to be subdivided, there are a good many 160-acre tracts that should be cut in two, and there are more than 100 nonresident owners whose land is either farmed by renters or not farmed at all; and with no water charges to be paid unless water is used, and very little if any taxes to be paid, the rule is to hold the land until prices increase. When public notice issues and charges have to be paid whether or not water is used there will be some inducement to sell land or bring it into a productive condition.

DEVELOPMENT PROGRAM ESSENTIAL

The first and most important step in the development program is to bring about a more profitable line of agriculture on the farms that have been settled. A change must be made from continuous crops of wheat to the production of grain and forage crops to be fed to livestock, or in other words the adoption of a program that contemplates changing the raw crop into a finished product that can be sold



Irrigated potatoes, Sun River project, Mont.

at a fair profit. The success of the farmer now on the ground is essential in bringing about the settlement of the balance of the project land. The best advertisement that any project can have is a bunch of prosperous farmers, for if the old settlers are making a success it will be much easier to get the new man to come in and try his hand at the game.

The Greenfields division has been farmed for the last eight years under irrigation and on most of the places a fair-sized tract of alfalfa has been planted, but the big crop has been wheat, and this continued cropping has resulted in reduced yields. Many of the fields are infested with wild oats, and here and there the Canadian thistle has made a start.

A change must be made and the question is, "What can I do?" In offering the following program it is assumed that the man on the farm has fair improvements, farm machinery, and livestock for raising wheat; two or more cows and a brood sow; and that he has been operating a 160-acre farm and has about 20 acres of alfalfa, which is the case with most of the farms. His crop in 1927 totaled 40 tons of alfalfa and a wheat crop that was sold for \$2,500, which leaves him about \$1,000 to begin operations in 1928.

SUGGESTED PROGRAM, 160-ACRE FARM

In preparing a program to be followed consideration must first be given to what the man wants to do, whether dairying is to be the major activity, or the raising of hogs or sheep. Possibly it may be a feeding program. The set-up to be considered fits fairly well for the average farm on the project and furnishes a standard plan that should be adopted as fast as can be done. On this farm 10 acres are taken up in roads, ditches, buildings, and yards, leaving 150 acres for cultivation, divided as follows: 60 acres alfalfa, 20 acres barley, 10 acres oats, 20 acres beets, 40 acres permanent pasture, and 10 acres roads, buildings, and ditches.

There are 11 tracts of 10 acres each to be farmed as shown in the accompanying diagram.

Permanent pasture is an important feature of this farm, and although it has not been tried to any great extent there is no reason why it should not be one of the most productive tracts on the farm. The principal objection to this schedule is the necessity of plowing 10 acres of alfalfa each year. If this proves to be too difficult the schedule can be changed by letting the alfalfa stand as long as it produces well and using sweet clover in the rotation. This will be shown in one of the later set-ups.

Estimated returns from fully operating 160-acre farm

Kind	Production	Gross income	Pasture	Hay	Grain
			Animal units	Tons	Lbs.
Cattle: 10 cows.....	250 pounds butterfat, at 35 cents.	\$875	10	40	13,000
4-5 heifers.....	Sell or replace.	250	3	10	1,000
5 calves.....			2	5	5,000
1 bull.....				6	
Sheep: 200 ewes.....	2,000 pounds wool, at 30 cents.	600	40	80	12,000
	180 lambs, 80 pounds, at 9 cents.	1,296			
4 bucks.....			1	2	500
3 sows.....	27 pigs, 200 pounds, at 7 cents.	378	1½	2	21,600
100 hens.....	1,000 dozen eggs, at 25 cents.	250			5,000
	100 springers.....	50			2,500
	50 old hens.....	50			4,000
	50 birds.....	200			
Turkeys: 4 hens, 1 tom.			6		2,000
6 horses.....					
Sugar beets.....	240 tons, at \$7.50.	1,800			
Total.....		5,749	64	169	66,600

After this farm swings into its full rotation plan the estimated crop production should be:

60 acres of alfalfa, at 3 tons, 180 tons.
20 acres of barley, at 50 bushels, 48,000 pounds.

10 acres of oats, at 60 bushels, 21,600 pounds.

20 acres of beets, at 12 tons, 240 tons.

40 acres of pasture, 60 animal units.

This farm will support 10 cows with yearling heifers and calves, 3 sows and 27 pigs, 200 ewes, 100 hens, 50 turkeys, and 6 horses. The estimated returns from the year's operations are shown in the accompanying table.

On the basis of a family of five and two hired men during the busy season the estimated expenses are:

Taxes.....	\$250
Water.....	320
Depreciation on machinery.....	350
Depreciation on buildings.....	150
Automobile.....	250
Miscellaneous.....	150
Groceries.....	500
Clothing.....	250
Shearing.....	36
Poultry.....	55
Bucks.....	60
Alfalfa seed.....	16
Beet seed.....	50
Breeding sow.....	3
Bull.....	30
Threshing.....	85
Beet labor.....	520
Other labor.....	900
Total.....	3,975

Summary:

Gross income.....	5,749
Expenses.....	3,975
Net.....	1,774

	1 Yr:	2 Yr:	3 Yr:	4 Yr:	5 Yr:	6 Yr:	7 Yr:	8 Yr:	9 Yr:	10 Yr:	11 Yr:
Tract 1	A	G	B	B	G	G	A	A	A	A	A
Tract 2	A	A	G	B	B	G	A	A	A	A	A
Tract 3	A	A	A	G	B	B	G	A	A	A	A
Tract 4	A	A	A	A	G	B	B	G	A	A	A
Tract 5	A	A	A	A	A	G	B	B	G	A	A
Tract 6	A	A	A	A	A	A	G	B	B	G	A
Tract 7	A	A	A	A	A	A	A	G	B	B	G
Tract 8	W	A	A	A	A	A	A	A	G	B	B
Tract 9	W	W	A	A	A	A	A	A	A	G	B
Tract 10	Sc	Sc	G	A	A	A	A	A	A	A	G
Tract 11	Sc	Sc	G	A	A	A	A	A	A	A	A

Note: A - alfalfa Sc - sweet clover
B - sugar beets W - wheat
G - barley or oats

Rotation program for 160-acre farm already in cultivation, Greenfields division, Sun River project, Mont.

This same farm could be run on a lamb-feeding basis, the rule being that 3 pounds of hay and 1 pound of grain per day should give an increase of one-third of a pound of mutton. On a 45 to 60 day feeding period an increase of $1\frac{1}{2}$ cents per pound is figured. With lambs received at 62 pounds and fed for 45 days the gross return on 1,600 lambs would be nearly \$4,000 and would require 108 tons of hay and 72,000 pounds of grain. Any farmer who is to follow the feeding game should start with a small bunch and work up to the big flock. It means an increased investment in fencing and feed racks and a good supply of stock water, but there is no reason why this should not be an important business on the project, as in the three counties directly to the north there are not less than 125,000 sheep, and the lambs should be fed at home and not shipped to outside feed yards.

The change from wheat farming to this plan of diversified farming means some good hard work, with each year's program fully worked out and expenses cut down in every possible way, for the greater the profit the sooner the farm can be fully developed. It will probably take three or four years to plant 40 acres of pasture. If there are 30 acres of old alfalfa on the place it would be possible to increase it to 60 acres for the next year and start with 10 acres of beets the third year, after plowing up 10 acres of old alfalfa. By the fourth year the rotation schedule would be well established.

Estimated returns from fully operating 80-acre farm.

Kind	Production	Gross income	Pasture	Hay	Grain
Cattle:			Animal units	Tons	Lbs.
6 cows.....	250 pounds butter fat at 35 cents	\$525	6	24	6,000
2-3 heifers..	Sell or replace.	150	$1\frac{1}{2}$	5	600
3 calves.....			$1\frac{1}{2}$	3	3,000
Sheep:					
40 ewes.....	400 pounds wool at 30 cents.	120	8	16	2,400
	40 lambs, 80 pounds at 9 cents.	288			
1 buck.....					
2 sows.....	20 pigs, 200 pounds at 7 cents.	280	1		100
					216,000
100 hens....	1,000 dozen eggs, at 25 cents.	250			5,000
	100 springers..	50			2,500
	500 old hens....	50			
Turkeys:					
2 hens, 1 tom	25 birds, at \$4.	100			2,000
4 horses.....			6	16	1,500
Sugar beets....	192 tons, at \$7.50.	1,440			
Total.....		3,253	24	67	39,100

Under the plan as outlined the first year should show a net return of about \$700 with dairy cows and hogs. The second year it will be possible to handle about 100 ewes and the net return should be a little better than \$1,000. The third year should show a net revenue of about \$1,500, and the fourth year will be approximately the result shown for the fully developed farm.

SUGGESTED PROGRAM, 80-ACRE FARM

The set-up for the 80-acre unit is as follows: 20 acres permanent pasture, 16 acres alfalfa, 8 acres grain and sweet clover, 8 acres sweet clover, 8 acres grain, 16 acres beets, and 4 acres roads and farm yard.

The alfalfa field is not to be disturbed until it begins to run out. Forty acres are used in the rotation plan of five tracts of 8 acres each, the rotation schedule being shown in the accompanying diagram.

The crop yields should run:

20 acres pasture, 30 animal units.
16 acres alfalfa, at 3 tons, 48 tons.
8 acres sweet clover, 12 tons.
10 acres barley, at 50 bushels, 24,000 pounds.
6 acres oats, at 60 bushels, 12,960 pounds.
16 acres beets, at 12 tons, 192 tons.

The livestock production and returns are shown in the accompanying table.

The expenses on this farm follow:

Taxes.....	\$100
Water.....	125
Depreciation on machinery.....	200
Depreciation on buildings.....	100
Automobile.....	200
Groceries.....	300
Clothing.....	200
Shearing.....	8
Poultry.....	50
Clover seed.....	8
Beet seed, etc.....	50
Beet labor.....	520
Breeding sow.....	2
Bull service.....	25
Threshing.....	40
Total.....	1,928

Summary:

Gross income.....	3,253
Expenses.....	1,928

Net..... 1,325

On this farm it is assumed that the man and his family can handle all work without employing outside labor except on beets. One interesting figure shown in this set-up is that the estimated net return on the 80-acre unit is 75 per cent of the net return on the 160-acre farm. The steps to be taken in swinging from wheat to a schedule of diversified farming and livestock are the same as for the 160-acre farm but with fewer difficulties to be overcome, largely because hired labor can be eliminated.

SUGGESTED ROTATION ON NEW LAND

In the future 80 vacant farms within the 42,000 acres now under irrigation will be open to homestead entry. Some of this land is in virgin sod. Some has been leased for agricultural purposes and wheat crops have been grown for several years past, although recent leases have been made with the proviso that a crop of sweet clover is to be planted with the

	1 Yr	2 Yr	3 Yr	4 Yr	5 Yr	6 Yr	7 Yr	8 Yr	9 Yr	10 Yr
Tract 1	10 A	20 A	P	P	P	P	P	P	P	P
Tract 2	G	A	A	A	A	A	A	A	A	A
Tract 3	G	Sc	Sc	G	B	B	Sc	Sc	G	B
Tract 4	W	G	Sc	Sc	G	B	B	Sc	Sc	G
Tract 5	W	W	G	Sc	Sc	G	B	B	Sc	Sc
Tract 6	W	G	Sc	Sc	Sc	G	B	B	Sc	Sc
Tract 7	G	Sc	Sc	G	G	Sc	Sc	G	B	B

Note: P - pasture
A - alfalfa
B - sugar beets

Sc - sweet clover
W - wheat
G - barley or oats

Rotation program for 80-acre farm already in cultivation, Greenfields division, Sun River project, Mont.

grain, the object being to restore the fertility of this land and put it in better condition for the new settler.

When these vacant farms are opened to homestead entry it is assumed that public notice will issue sometime in the early fall so that entrymen may make their selection and arrange to establish residence in time to start work the following spring. When the project land is properly farmed the first year it has given excellent returns, and this has always been accomplished by breaking the sod during midsummer and permitting it to rot during the fall and winter months, and then in the spring planting a crop of grain. If land is opened in the fall it would be impossible for the new settler to have the farm plowed at that time. If the breaking is put off until the following spring, about the best crop that can be put in is flax which means a considerable lower return than if a good crop of wheat can be produced. The expense of breaking 80 acres of sod will be about \$400, which means a cash expenditure on the part of the new settler. One of the best moves that could be made to start the new settler off under the most advantageous conditions would be for the Government to contract the breaking of these new units during the summer of the year preceding the date of opening. Where land has been farmed in wheat and sweet clover, arrangements could be made to have this ground either summer fallowed to eliminate weeds or plowed in the fall of the year after the sweet clover has been harvested. This will put the ground in excellent condition for a wheat crop that should yield from 30 to 40 bushels.

The accompanying diagram shows the rotation plan on the new farm and the change from wheat to diversified farming and livestock production. Ten acres are to be planted as a permanent pasture, 15 acres to alfalfa, and 5 tracts of 10 acres each put on a rotation schedule of grain and sweet clover, sweet clover, grain, beets for two years, and then back into sweet clover and grain. This set-up varies slightly from the 80-acre tract previously considered, but this has been done to show that there are a large number of plans that can be worked out.

The new settler arrives on the ground with \$2,000 or its equivalent, and must show to an examining board that he is qualified to operate a farm. In the tabulation of expenses it will be assumed that the cost of breaking is to be distributed over a period of five years. Local merchants are willing to make sales of building materials, fencing, and farm machinery on the basis of one-half cash and the balance after the first crop is harvested. In starting on a new farm

Estimated expenditures on new farm of 80 acres

Item	First year	Second year	Third year
House.....	\$700		
Barn.....	250	\$50	
Implement shed.....	75		
Chicken house.....	100	50	
Granary.....		50	
Fencing.....	150		\$60
Well.....	25		
Breaking.....	75	75	75
Horses (4).....	300		
Harness.....	100		
Cows.....	75	(3) 225	
Hens.....	8		
Baby chicks.....	12	25	25
Turkeys.....		10	
Hogs.....		25	
Machinery:			
Riding plow.....		150	
Walking plow.....	27		
Disk harrow.....	10		
Spike harrow.....		30	
Wagon.....	130		
Hay rack.....	15		
Mower.....		110	
Rake.....		57	
Cultivator.....	12		
Small tools.....	50		
Drill.....	15	15	10
Separator.....		50	50
Depreciation on machinery.....		50	50
Automobile.....	200		
Automobile operation.....	150	150	150
Seed.....	150	22	60
Harvesting.....	113	65	40
Threshing.....	120	115	55
Hay.....	40	25	
Oats.....	75		
Ground feed.....	25	10	
Miscellaneous.....	200	100	100
Taxes.....	25	25	25
Water, operation and maintenance.....	80	80	80
Construction.....	80	80	90
Furniture.....	350		
Living.....	450	450	400
Life insurance.....	50	50	50
Sickness.....	50	50	50
Incidentals.....	100	100	100
Totals.....	4,387	2,294	1,470

it will be necessary to exercise every possible economy. Some farm machinery will have to be rented for the first few years and it will be necessary to stack all grain crops to reduce the cost of threshing. In any estimate of costs and returns some items are apt to be omitted, some may be under estimated, and some over estimated, which, with a reasonable provision for incidentals, should give a fair balance. The estimated expenditures for the first three years are shown in the accompanying table.

The returns for the first year's operations are:

10 acres oats (at 50 bushels per acre), 500 bushels at 57 cents.....	\$285
65 acres wheat (at 25 bushels per acre), 1,625 bushels at \$1 1, 625	
2 acres potatoes (at 150 bushels per acre), 300 bushels at 60 cents.....	180
Poultry (120 dozens eggs at 35 cents).....	42
Outside labor in fall.....	150

Total..... 2,282

The returns from one cow are used to reduce living expenses.

Crop returns, second year:

16 acres alfalfa, at 2 tons, 32 tons.	
7 acres barley, at 55 bushels, 18,500 pounds.	
3 acres oats, at 50 bushels, 5,700 pounds.	
40 acres wheat, at 25 bushels, 1,000 bushels.	
10 acres sweet clover used for pasture, seed crop and hay.	

Tract	1 Yr	2 Yr	3 Yr	4 Yr	5 Yr	6 Yr	7 Yr	8 Yr
#1 - 10 acres:	G	Sc	Sc	G	P	P	P	P
#2 - 16 acres:	W	A	A	A	A	A	A	A
#3 - 10 acres:	W	G	Sc	Sc	G	B	B	Sc
#4 - 10 acres:	W	W	G	Sc	Sc	G	B	B
#5 - 10 acres:	W	W	G	Sc	Sc	G	B	B
#6 - 10 acres:	W	W	G	Sc	Sc	G	B	B
#7 - 10 acres:	W	W	W	Sc	Sc	Sc	Sc	G

Note: A - alfalfa P - pasture
 B - sugar beets Sc - sweet clover
 G - barley or oats W - wheat

Livestock return and feed

Kind	Amount	Pas- ture	Hay	Grain
		<i>Animal units</i>	<i>Tons</i>	<i>Lbs.</i>
4 cows, 250 pounds butter- fat, at 35 cents.....	\$350	4	16	4,000
3 calves.....		1½	3	3,000
1 sow, 8 pigs, at \$15.....	120	1	1	6,400
100 hens, 500 dozen eggs, at 25 cents.....	125			6,000
50 springers.....	50			2,500
25 old hens.....	25			
Turkeys (2 hens), 25 birds, at \$4.....	100			2,000
4 horses.....		4	16	1,500
1,000 bushels wheat, at \$1.....	1,000			
600 pounds clover seed, at 6 cents.....	36			
Outside labor.....	100			
Total.....	1,906	10½	36	25,400

Crop returns, third year:

10 acres to be planted to permanent pasture.
16 acres alfalfa, at 2½ tons, 40 tons.
20 acres sweet clover (½ pasture, ½ hay), 20 tons.
13 acres barley, 50 bushels, at 48 pounds to bushel, 31,000 pounds.
7 acres oats, 50 bushels, at 38 pounds to bushel, 13,000 pounds.
10 acres wheat, 22 bushels to acre, 220 bushels.

Kind	Amount	Livestock return and feed		
		Pas- ture	Hay	Grain
		<i>Animal units</i>	<i>Tons</i>	<i>Lbs.</i>
6 cows, 300 pounds butter- fat at 35 cents.....	\$630	6	24	6,000
2 heifers.....		1	4	500
2 calves.....		1	2	2,000
3 sows, 30 pigs at \$15.....	450	1½	2	24,000
100 hens, 1,000 dozen eggs at 25 cents.....	250			5,000
100 springers.....	50			2,500
50 old hens.....	50			
Turkeys (4 hens and 1 tom) 50 birds at \$4.....	200			4,000
4 horses.....		6	16	1,400
220 bushels wheat at \$1.....	220			
Outside labor.....	100			
Total.....	1,950	15½	48	45,400

Summary of expenses and returns for first three years follow:

First year's expense.....	\$4,387.00
Less cash on hand.....	2,000.00
	2,387.00
Credit for sales.....	2,282.00
Deficit.....	105.00
Second year's expense.....	2,294.00
	2,399.00
Credit for sales.....	1,906.00
Deficit.....	493.00
Third year's expense.....	1,470.00
	1,963.00
Credit for sales.....	1,950.00
Deficit.....	13.00

The returns and expenses for the fourth year should show an increased margin on the right side of the account, and the returns for the fifth year, when sugar

beets come into the rotation, should show a return of \$1,500 to \$1,800 over expenses.

It is granted that this favorable showing depends largely on the wheat crop of the first year. A crop of 25 bushels is hardly an average crop; 40 bushels is often obtained, and there is good reason to believe that the new settler can do even better than shown in this set-up. After any estimate has been made the next thing is to figure out how you can reduce expenses and increase returns. These set-ups do not take into consideration the unusual which frequently happens, such as damage by hail or cut-worms, diseases to livestock, or serious sickness and deaths in the family. In the early years of development a serious set-back makes a very decided difference in net returns and although they must be taken care of they do not properly belong in the average operations which are being considered.

FINANCING BY LOANS

The costs and returns show a deficit of \$493 in the second year. Loans may be secured from three sources—first, from local banks where short-time loans may be made at 8 per cent; second, from the livestock department of the Agricultural Credit Corporation of Minneapolis, where loans up to \$1,000 may be secured at 6 per cent for the purchase of livestock. An initial payment of 20 per cent is required at the time the loan is made, or security on additional livestock clear of encumbrance to margin the loan. The repayment schedule calls for 30 per cent the first fall, 30 per cent the second, and 40 per cent at the end of the third year. This passes for a 6 per cent loan, but there are additional fees covering purchase costs and insurance of stock which brings the interest charge up to nearly 7½ per cent. There is a possibility that the limit of \$1,000 may be increased. Applications for loans must be accompanied by a satisfactory financial statement and the approval of a local committee, preferably a banker, business man, and farmer working in cooperation with the county agent.

Third, there is the Federal Intermediate Credit Bank of Spokane, which requires the formation of a local agricultural credit corporation under State law with an investment of not less than \$10,000 and not less than 3 nor more than 13 incorporators. Loans are made to properly organized cooperative marketing stock associations on staple agricultural and livestock products for not less than six months at 5 per cent. This source would not be of much assistance to the individual farmer, but assurance has been given by financial institutions in Great Falls that when the need arises action will be taken so that worthy farmers can be given financial assistance.

Thus far the Federal Land Bank of Spokane has made no loans on the Greenfields division, but assurance has been given that the project will be inspected shortly for the purpose of determining whether the bank should make loans on the irrigated farms.

If the new settler can get along with a short-time loan of about six months he could undoubtedly make the best deal through the local banks. The man who is well established and needs some money to purchase additional dairy cows or sheep could probably do better through the Agricultural Credit Corporation.

THE SETTLEMENT PROBLEM

But where are the new settlers coming from? There are a few local people waiting to file on homesteads, but that won't add anything to the man power on the project, which is woefully deficient. There are a large number of renters in other sections who would like to get a toe hold in a new country, but they haven't money enough to leave their present location, so there is little hope there. Assistance may be expected from the railway companies and in the case of Sun River there are the Great Northern and Milwaukee that cross the irrigable lands. The effort made by them to secure new settlers results in increased freight receipts so they are directly interested in the successful development of the project. The best advertisement is the successful man on the farm. He can tell his friends back in his old home what he has done and help bring in some more experienced farmers with sufficient capital to make a go on the irrigated farm. The \$2,000 requirement is going to hit hardest on the sons of farmers now on the project who are anxious to see their boys get a start on a farm of their own, but there can be no exceptions made in this class. There are enough handicaps without adding a lack of capital. The nonresident owner should be wise enough to read the handwriting on the wall—that soon he must pay, whether the place is farmed or not, and it behooves him to either sell at present going prices or go in partnership with a good renter and help him get a start so that he can buy the place.

Settlement work must of necessity start at a slow pace. Each case of success is going to help things speed up; each case of failure makes it that much harder to finish the job. And this brings us face to face with the necessity of seeing that the new man on the farm does the right thing at the right time; that he gets a square deal in buying stock and equipment; and that he makes definite plans to meet his obligations. In other words, supervision is an important factor in developing a successful farm.

Curbing Land Speculation on the Federal Reclamation Projects

SPECULATION in privately owned land under a proposed Federal reclamation project is being successfully curbed by the Bureau of Reclamation. On all of the more recent projects proposed for construction, part of the irrigable area, which from an economic standpoint should be a part of the project, is in private ownership and undeveloped. In its raw state it is worth no more than any other undeveloped land. Heretofore, however, the merest suggestion of the construction by the Government of irrigation works has resulted in an inflation of land prices and the pyramiding of these prices whenever such land has changed hands. This has brought about either a final prohibitive price and the consequent lack of development of the land, or the land has ultimately been purchased under the incentive of a boom by a prospective settler who then finds that his usually meager capital has been practically exhausted in the transaction and his remaining funds are insufficient properly to develop his purchase when water is available. This means unnecessary struggle and hardship even if the settler finally succeeds, and in too many instances failure and the loss of his entire investment.

EXCESS LAND CONTRACT

To prevent such a situation on the new projects under construction, the Bureau of Reclamation, prior to construction, entered into contracts with the owners of such land, included in the irrigation district, providing for an appraisal of the land at its value as undeveloped land, without reference to the proposed irrigation development. Under the reclamation laws, water may not be furnished to lands in private ownership exceeding the area sufficient to support a family and in any event not to more than 160 acres in one ownership. Under the contract, all areas held in a single ownership in excess of 160 acres must be sold to settlers at not more than the appraised value, which ranges from \$1 to \$20 an acre, depending on the depth and character of the soil and its topography. The owner of a large holding may select the 160 acres he wishes to retain for his own use, but must sell the remainder at or below the appraised price. He is required to execute a recordable contract binding the land to the requirements of the law and of the construction contract with the irrigation district. If a large landowner refuses to

sign such a contract, he is not entitled to receive water although his land is nevertheless to be assessable for the project charges because of its inclusion in the irrigation district. The large landowner has three years after water is ready for delivery to his land within which to dispose of his excess land by sale at or below the appraised price. If he fails to dispose of the excess within this period, the Secretary of the Interior is empowered to order the land into the market and sell it at whatever price may be obtained.

INCREMENTED VALUE CONTRACT

Lands held in areas of less than 160 acres may be sold for more than their appraised value upon the condition that 50 per cent of the selling price in excess of the appraised value is turned over to the irrigation district to be applied as a credit to the water right on that particular tract of land. In this manner, sales of such land at excessive prices are not forbidden, but if a sale is made the land concerned receives payments on the water charges to be due therefrom to the extent of one-half of the excess of the sale price over the appraised valuation.

It is believed that through these two types of contracts an effective curb has been placed upon the evil of speculation on undeveloped land in Federal irrigation projects, and a new settler, purchasing such land at a reasonable price, determined by an independent appraisal, has a far better chance to succeed.



Harvesting irrigated wheat on the Shoshone project, Wyo.



Reclamation Project Women

By Mae A. Schnurr
Secretary to the Commissioner



Establishing a Home on the Land



No obstacle to pioneer settler

AGRICULTURE and the farmer and his problems are coming in for a lot of discussion these days, but the average person outside of an irrigated area, I am afraid, never stops to think how much greater are the problems of establishing a home in the desert.

The irrigation farmer and his wife must possess vision, capacity for hard work, and just lots of grit to carry them through until their home is established and they begin to see the effects of their labor.

In every one of us there is an inborn desire for some place to call our home, something to cherish and around which to build our dreams. This, in most cases, on the desert, is merely a shack.

The average person's heart would falter at a scene such as the one reproduced on this page, showing the desert, and yet persons with pioneering spirit and vision can look at this scene with fluttering hearts and realize that with a lot of hard work, this land can be cleared of sage-

brush, leveled, water brought to the land by means of canals, a modest little home built, and a farm to be proud of established around this home.

The farmer deserves all the credit that can be given him for this pioneering work. Ask any of them if they could have succeeded without the comforting assistance and helpfulness of a self-sacrificing wife.

Unless you have planned a home, you can not realize what is put into the planning of each and every detail of establishing one, and that is particularly true where that home is being placed in the middle of a scene, such as the desert scene shown.

Can you picture two young people discussing plans for establishing an irrigation farm? Many of them have enjoyed the comforts of a fine home, a good education, and some of the nice things this world affords, in the towns or in modern rural districts. They can't start on a very large scale, so their plans are made to fit their resources. Each is determined to put the best in them into this effort to establish a real home, and the first of their dreams is realized in the building of a home somewhat like that shown in the picture.

When the house is finished, the farmer's wife steps prominently into the picture. Curtains are up at the windows and comforts of all kinds begin to come in evidence in the home. These so often do not represent money value, as much as an evidence of the ingenuity of the woman in making, out of practically nothing, comforts that are felt, and a certain satisfaction that here are things that have been established by her own effort.

There will come a time, however, when everything has been accomplished on the scale which they can afford, and then what is the farmer's wife to do? Will she sit and twirl her thumbs and get more lonesome every day, with no neighbors to speak to and no means of going to centers of activity?

The "home spirit" is rather charmingly described, in verse, by Henry Van Dyke, whom it was my pleasure to meet in Yellowstone National Park, in 1921:

Oh, London is a man's town, there's power in the air;
And Paris is the woman's town, with flowers in her hair;
And it's sweet to dream in Venice, and it's great to study Rome;
But when it comes to living, there is no place like home!

Here I am also reminded of a little shack in the desert which had a sign that was so large it looked as though the house had been built onto it, that read: "Tain't much but its our'n." This is the spirit. They have no apologies to make. What they have they are satisfied with, and they realize if there is anything else to get it must be secured through their own efforts, so right here is where the farmer and his wife get their heads together on the problems involved, and the task which would have been mighty hard is made easier pulling in double harness.

Personal observation and a reading of the record show aptitude, progressiveness, and an insatiable desire on the part of the farm woman to shoulder, with her husband, the responsibilities, not only of the farm home but of everything that goes into making that home and the farm that supports it a going concern.

It is the woman who has pioneered to this extent who receives a new neighbor with open arms. This might mean a neighbor miles away, but it is a neighbor nevertheless, and her effort to make her feel satisfied is one of the outstanding features of the upbuilding of a great farming community. They all started just that way. This feeling of neighborliness is very pronounced on our projects. The cheerful greeting and the extending of a hand of welcome to a new arrival are laying the foundation for another home in the community. Our great Nation is made up of millions of these, but that makes the unit no less important.

The sprouting of the first crop affords satisfaction secondary only to seeing the completion of the home. Instead of looking out of one of the windows and seeing a stretch of sagebrush or leveled ground, the fruits of labor are in evidence.

Thus the nucleus of a farm community is established, that later boasts of a town, stores, schools, clubs, and everything that goes into making life in a farming section



First boards of a new home

and Their Interests



and Associate Editor
New Reclamation Era



attractive. The groundwork for all this is laid by just a handful of people. Initiative and organizing ability are given opportunity for full play. It is no small task to bring about these things, even gradually. After the first generation has weathered the storm, the second generation starts off with fewer handicaps, having the experience and guidance of their elders.

It is true that the problems increase at this point, as there is added to what already exists the problem of keeping the younger generation on the farm. Love of the land instilled in a child has been found to be one factor that will weather the storm.

To-day more than ever before, organized bodies are endeavoring in every way to assist the rural population. The position of agricultural engineer has practically been established to better conditions in this field. Such organizations as the American Society of Agricultural Engineers have rendered invaluable service in this connection. The large electrical corporations have set up organizations in the States, which also have rendered a class of service that can't be measured in dollars and cents.

They figure it is good business to have a happy, contented rural population in our country. Of course, their return is the sale of electrical devices; but in educating the rural population, much has been done to lighten the work on the farm and in the home, thus preserving energy that may be expended in the betterment of conditions in the community. Magazines and journals all over the country, by their attractive illustrated advertising and special articles, assist in lightening the burden of farm work.

What is the result of this assistance? Education in a field that is of importance to the Nation as a whole, bigger and better crops, with consequent greater return with a larger income, and the purchasing of conveniences that mean a little spare time to the farmer and his wife.

This is not used as leisure time. Pride in their surroundings prompts civic movements that mean tree-lined highways, beautification of the grounds surrounding the home, and sufficient social activity to draw closer to each other

the people in the community and have them working as a body for a bigger and better village, town, then city.

There is found nothing finer in a person's make-up than pride in his community. This means forward movements that will always reflect on its prosperity. Lack of this pride means just the opposite. It is people, not natural advantages, that make a country prosperous, or the reverse.

What great strides forward have been made are very much in evidence on our reclamation projects. Examples of the struggling settler to the prosperous one, in a completed community, are scattered over our projects.

Thus as new projects are undertaken, the story repeats itself. Raw land must be brought under cultivation, new homes established, communities built up, and more homes added to this Nation of homes.

The Government is doing what it can in placing at the disposal of the farmer the best thought of its specialists, and assigning to the field, experts to advise on scientific methods of farming, treatment of diseases, and the many things that go into having the soil respond with good crops by the application of water.

A corps of trained workers is spread all over the United States to assist the housewife and show her better methods.

Nevada State Fair Boosts Newlands Project

The Twenty-seventh Annual Nevada State Fair was held recently at Fallon, Newlands project, Nevada. The exhibits were fully as large and equally as good as at any previous State fair. Churchill County, which comprises the Newlands project, took first prize for the best county exhibit. The splendid showing of dairy stock at the fair spoke volumes for the progress along the lines of pure-bred dairy stock on the project. Exhibits of sheep, goats, rabbits, turkeys, and chickens were very creditable and indicated material progress in the establishment of these industries. The milkmaids' contest created more interest and enthusiasm than any other one feature of the fair.



A home established and first crop

Here also the best thought of specialists is carried to the rural woman through the medium of special bulletins, periodicals, radio talks, etc. The people who want to get ahead certainly are offered the opportunity. Traveling libraries are no small factor in bringing the proper reading matter into the homes of communities that can not afford stationary libraries.

No ground has been lost and much has been gained. As time goes on, new and better ways will be devised and this knowledge placed at the disposal of anyone who desires it. Finding these ways is the duty of people who are handpicked because of their special knowledge and constructive thinking. In this way the farmer and his wife can proceed along familiar lines, adopting such new and better methods as may be found. The advantage of this policy is clearly shown in the practice of the farmer giving his full thought, attention, and brawn to the production of the best possible crop, and then turning over the business management of marketing that crop to highly trained people in his cooperative organization.



Fruits of labor and patience

Obligations of and Collections From Water Users on the Projects

By J. L. Lytle, former superintendent, Yakima project, Washington

THE Bureau of Reclamation is required to collect and return to the United States Treasury the funds appropriated by Congress for the bureau's activities. It is one of the few bureaus required to do this. It may be considered, therefore, as having two major duties to perform in connection with the funds it handles:

1. To see that they are properly expended, with good judgment, and maximum results obtained.

2. The responsibility and duty of collecting and returning to the United States Treasury the funds expended.

In order to secure the payment of the obligations due the bureau and to insure the return of the reclamation fund, at the same time accomplishing the best results in its expenditure, a carefully planned line of procedure is followed in the development of a project. An engineering investigation is carried out and an estimate made of the cost. Soil and economic surveys and reports are made for the purpose of determining whether, under ordinary conditions, a settler can be expected to make sufficient returns from the land to enable him to live and pay water charges.

If results of the preliminary investigation show that the project is feasible, and it is approved, an organization, which is usually an irrigation district representing the landowners, is required to enter into a binding obligation in the form of a contract providing for the repayment of the cost of the project, which becomes a superior lien on the land, before funds are

appropriated or construction work is started.

Repayment of the charges under the obligations assumed is spread over a period of years (which the present law provides shall not be in excess of 40), no interest being charged on deferred payments until due, after which a penalty of one-half of 1 per cent per month is charged until paid.

EVIL OF LAND SPECULATION

The period of construction is one of general development on the project, everyone in the vicinity is optimistic, and unless measures are taken to prevent it all the advantages and favorable conditions brought about by the Bureau of Reclamation building the project with interest-free money will be capitalized and land prices will be advanced to many times their real value, thus putting a burden on the new settler that may seriously affect the economic feasibility of the project and greatly lessen the settler's chance for success, as well as lessening both his ability and his desire to pay the obligation for the project works.

On projects approved for construction during the past few years, a policy has been adopted providing for the appraisal of the agricultural value of the land, and also certain regulations regarding the sale of the land, which it is believed will prevent objectionable speculation without unduly limiting the incentive for development. Projects where the cost

of water is high can not pay a tribute to real-estate dealers, or any other class of men, and progress satisfactorily.

Also, a plan has been adopted for selecting settlers properly equipped with a desire to farm, sufficient finances, and some experience. This plan will materially strengthen the economic foundation of the project by giving the right kind of a farmer a good opportunity to develop to the fullest extent of his ability, thus promoting agricultural excellence and a satisfactory development generally.

With these economic safeguards and a superior security, there should be a fair fighting chance to collect the obligations due the Government from the project.

COLLECTING THE MONEY

When construction has been completed and the time comes for the payment of regular operation and construction charges, the plan of development and policies affecting the economic foundation of the project get their first real test. Probably previous to this no particular attention has been given to the matter of payments by the land owner or anyone else, and he finds himself faced with the necessity for paying substantial amounts to the Bureau of Reclamation each year in order to discharge his obligation to the United States to secure the supply of water upon which the success of the project depends. At this stage of the development, the matter of extension of time is likely to come up if encouraged at all.

It very often happens that there is as much energy expended in an effort to secure deferment of payment or extension of time in which to pay water charges as was formerly expended in securing funds from the United States for the construction of the project and the assumption of the obligations to repay them.

Generally speaking, there appears to be an inherent tendency among a certain percentage of the human family to postpone the payment of even their just obligations until it is absolutely necessary to make such payment in order to prevent the incurrance of an objectionable penalty or more serious results. This tendency appears to be more evident where payment of obligations due the Government is concerned.

Settlers on irrigation projects are no different from the average and therefore the matter of collecting the obligations, which were voluntarily and often very anxiously taken on in order to have the



Irrigated oats in shock, Minidoka project, Idaho

bureau construct the irrigation works, becomes a task requiring patience, firmness, and skill of a high order.

Since a collector is seldom popular among those from whom he collects, it will readily be seen that during this period of collecting obligations the bureau can not expect to enjoy the same degree of popularity that it did during the period of investigation and construction.

In view of the numerous factors and influences that have to be contended with, and unless the penalties provided in case of failure to pay are heavy, or the rate of interest collected on delinquent charges considerably in excess of the prevailing rate at the banks in the vicinity, they will not have sufficient influence in the matter of collections to accomplish the desired results, and eventually the rather heroic measure of turning off or refusing the delivery of water to a certain percentage of the water users in order to force payment of charges has to be resorted to. The very serious objection to this method of collecting charges, however, is that it is likely to impair the security by drying up a valuable crop.

In order to maintain the credit of irrigation development in general at such a stage that private capital can be interested and the Federal Government continue to build irrigation works, the economic phase of reclaiming arid lands needs to be given most careful attention from the inception of a project. The return of the capital investment must be ever kept in mind in considering the feasibility of the undertaking, regardless of sentiment, powerful influences, or political pressure. If the irrigation project is to be maintained as a solvent and going concern, the same business principles and methods must be established and followed in conducting its affairs that are found necessary in any other big business venture or industry.

It is generally recognized that any business that does not have a well-organized and efficient credit department and that does not rigidly enforce collection of the obligations due it can not long survive. The procedure for assessing and collecting annual charges on an irrigation project must be positive, effective, and enforced in such a manner that there will be no question but what the assessments will be paid and the funds necessary to discharge its obligations be available when needed.

Irrigation charges should be regarded as one of the cost items necessary for the securing of the important element of the farm plant and should be provided for as carefully as the capital investment in the land itself. Privately operated irrigation enterprises do not permit delinquencies for any length of time in the payment of assessments for irrigation charges, and as a result those owning the land expect to pay them promptly. An investigation of

the records of many of these districts shows their delinquencies to be comparatively small. An extension of time within which to pay charges can not be given by anyone, and therefore is not considered.

As just stated, an irrigation project must necessarily be governed by the same economic principles and laws that govern business in general. The management of such enterprise can not violate the rules of good business practice for any length of time and not eventually affect the economic foundation of the project as a whole to the extent of lessening its credit, because such a practice lowers the morale, spirit and independence of the individual settler.

Since the payment of water charges on a Government project is as much a requirement of law as on a project built with funds secured from private sources, the same impersonal and sentiment-free methods and practices must be followed if the obligations due the Government are to be collected satisfactorily.

BEST COLLECTION RESULTS

The best results in the collection of obligations on Government reclamation projects have been accomplished through the irrigation district organization. It provides the best available security and the taxing power possessed by it provides a positive and certain means for making the necessary collections.

The irrigation district laws of the State of Washington are working out with very satisfactory results. Under these laws, the assessments become a lien, which is paramount and superior to any other lien theretofore or thereafter created, whether by mortgage or otherwise, except for a lien for prior assessments for general taxes, and if the charges are not paid the land is subject to sale.

The assessment roll is submitted to the county treasurer on January 15. Assessments become delinquent on May 31 following unless 50 per cent of the assessments shall have been paid. If this 50 per cent is paid, the remainder of the assessment will not become delinquent until November 30 next following. Unless 50 per cent of the assessment is paid on the 31st day of May each year, all unpaid assessments are delinquent and the treasurer adds a penalty of 5 per cent and collects interest at the rate of 12 per cent per annum from date of the delinquency and may proceed to advertise and sell the land for irrigation taxes within 30 days of date of delinquency, with a period of two years for redemption after the land is deeded to the district.

In the Yakima Valley, most of the privately operated projects are organized as irrigation districts and as a rule are collecting their annual assessments without appreciable delinquencies. While

the lands on these projects, like all other lands in the Yakima Valley, are very productive, the annual charges are also comparatively high.

An investigation of the records of the payment of assessments for irrigation on seven of the small privately operated projects in the Yakima Valley, varying in area from 2,000 to 13,000 acres and including a total area of 57,572 acres, during 1923, 1924, and 1925 shows a comparatively small amount of delinquent charges. On February 1, 1927, the average delinquency on these divisions was 2.3 per cent for 1923, 4.7 per cent for 1924, and 7.4 per cent for 1925.

Where the bureau has contracts with individual water users and collections are made through a water-users association, water charges, as a rule, are not being paid as promptly as where collections are being made by an irrigation district. Under this plan of collection, a 5 per cent discount is allowed on operation and maintenance charges paid before their due date, which is usually taken advantage of by probably 50 per cent of the water users.

The penalty on delinquent charges, under existing laws, is only one-half of 1 per cent per month, which on some projects is less than the prevailing rate of interest on borrowed money. Also, the water users can be one year in arrears and get water. The result is that many find it good business to pay the penalty on due charges, thus getting the use of the money that is due to pay obligations for water at a lower rate of interest than they would have to pay if they borrowed it from a bank, and pay up just enough charges to get water.

From a comparison of results obtained under the two methods of collecting obligations due the United States, it is at once apparent that collections can be made through the irrigation district much more satisfactorily than any other way yet devised, and the Government gets the best security available, with the district's taxing power as an aid in collecting.

With the adopted policy of, as far as possible, handling all negotiations with the landowners on projects through irrigation districts and requiring these districts to enter into joint liability contracts, under the terms of which the district assesses and collects all obligations due the United States from the individual landowners and pays it to the United States in lump sums on the due dates, the matter of collecting charges has been placed on a substantial and practical business basis that will do much to insure the steady return of the reclamation fund to the United States Treasury and be of material assistance to the bureau in carrying out the second major duty referred to at the beginning of this paper.

Vale Irrigation Project (Oregon) Booklet Issued by Bureau

THE Bureau of Reclamation, Department of the Interior, has just issued an attractive illustrated booklet containing information for prospective settlers concerning the Vale irrigation project in eastern Oregon.

The booklet discusses the project under the headings of location, irrigation plan, cost and repayment of water right, present development, land classification and appraisal, cost of purchase and development of farms, need for settlers when water is available, soil and climate, crops, livestock and poultry, crop utilization and markets, towns, railroads, highways, and recreation.

Stress is laid on the fact that the time when irrigation water will be available can not be definitely stated, as this will depend on the progress of construction and the appropriations made by Congress. In consequence the Bureau of Reclamation does not recommend that settlers buy privately owned land on the project or attempt to farm such land before water is available for irrigation, as the precipitation is too light to produce a profitable crop under dry-farming methods. The small amount of public land on the project, amounting to about 1,200 acres, has been withdrawn from entry and will not be made available for settlement until water is ready for irrigation.

Usually when the Bureau of Reclamation undertakes the construction of an irrigation project, it is necessary first to build a storage dam to conserve water for irrigation purposes. In the case of the Vale project, however, the Warm-springs storage dam has already been constructed by the Warm-springs irrigation district. This reservoir has a capacity of 170,000 acre-feet, and the Federal Government has contracted to purchase for the Vale project not to exceed one-half of the stored water. This water, together with some natural flow rights on the Malheur River, will furnish the water supply for the project.

In pursuance of the general policy of the department to prevent land speculation, all of the lands in the Vale-Oregon irrigation district have been appraised at their present value, without reference to the proposed irrigation development. The value of undeveloped land is \$1.25 an acre for nonirrigable land and from \$5 to \$15 an acre for the irrigable land,

depending on depth and character of the soil and its topography. All areas held in a single ownership in excess of 160 acres must be sold to settlers at not more than the appraised value. Lands owned in areas of less than 160 acres may be sold for more than their appraised value upon the condition that 50 per cent of the selling price in excess of the appraised value shall be turned over to the irrigation district to be applied as a credit to the water right on that particular tract of land.

Storage Reservoirs as Pleasure Resorts

If you wish to spend a few days fishing, hunting, boating, or just enjoying rest and recreation, you should look over the opportunities afforded by the storage reservoirs on the Federal irrigation projects, described in a well-illustrated booklet, Federal Irrigation Reservoirs as Pleasure Resorts, just issued by the Bureau of Reclamation.

With the more complete settlement and development of the projects, the reservoirs created by the construction of the larger storage dams have assumed more and more importance in the social life of the project settlers, aside from their primary function as basins for the storage of irrigation water. They are entering increasingly into the life of the people as pleasure resorts and playgrounds, as bird sanctuaries, and as excellent fishing grounds. The varied recreational attractions of 39 reservoirs on 16 irrigation projects are described in this booklet, copies of which may be obtained by addressing the Commissioner, Bureau of Reclamation, Washington, D. C.

The completion of the project will afford an excellent opportunity for 300 to 400 qualified settlers. The principal crops grown on land now irrigated in the vicinity of the project include alfalfa, the cereals, root crops, potatoes, truck, and fruit. Red clover for hay and seed is also profitable. The large yields and low cost of producing alfalfa and corn make this an excellent country for the production of livestock and dairy products.

British Settlers Coming to Canada

A plan is reported from England for a new scheme of land settlement for military and naval families. The families of 30 former soldiers will be settled in Canada next spring. Each family will have a preliminary course of agricultural training over a period of six months before migrating. They will be placed on farms in settled districts. Where necessary the British treasury will advance each family an amount up to \$1,500 on easy terms for the purchase of stock and equipment.

More Farmers Engage in Cooperative Enterprises

A larger number of farmers than ever before are participating in cooperative marketing and purchasing. Some of the farmers are participating as members of particular associations, some as shareholders, some because of being under contract to market cooperatively, and some as shippers, consignors, or patrons, using the facilities furnished by the various cooperative enterprises.

Including duplications because of farmers belonging to two, three, four, or five associations, the estimated membership is 3,000,000, divided among the more important of the commodity groups as follows: Grain marketing associations, 900,000 participants; associations marketing dairy products, 600,000; associations marketing livestock, 450,000; associations marketing fruits and vegetables, 215,000; cotton marketing associations, 140,000.

Approximately 70 per cent of the total membership is in the 12 North Central States, compared with 53 per cent in 1925 and 55 per cent in 1915. Less than 12 per cent of the membership is now in the Southern States, compared with 30 per cent in 1926 and 16 per cent in 1915. The Pacific Coast States are of about the same relative importance, in regard to membership, as in 1925.

IN point of milk yield the dairy cows of Nevada are exceeded by only four States, according to figures prepared by the agricultural extension division of the University of Nevada. The average annual production of Nevada cows is 5,263 pounds of milk. The dairy industry on the Newlands project is in a large measure responsible for this excellent showing for the State as a whole.

Murray River Irrigation Works in Australia

The following is a résumé of the extensive water conservation work on the Murray River, Australia, being carried on under the joint control of the Governments of New South Wales, Victoria, and South Australia, prepared by E. D. Shaw, executive engineer, and published in the Industrial and Mining Standard, July 12, 1928:

The Hume weir will cost \$22,500,000 to construct. This mighty reservoir will cover an area four times as large as Sydney Harbor, and will have a capacity of 2,000,000 acre-feet. This inland sea will be larger than the Assuan Reservoir in Egypt, and second in size in the world only to the Elephant Butte Reservoir in America, which has a capacity of 2,600,000 acre-feet.

The wall of the Hume weir will be a mile in length and 120 feet in height, stretching from Victoria across the Murray into New South Wales. Two bridges across the Murray will be submerged when the weir is built, and a new bridge 3,000 feet in length and 100 feet in height is being constructed at Bethanga, at a cost of \$975,000, to provide communication between Victoria and New South Wales. The bridge will be one of the largest structures of its kind in Australia.

The Murray River work is an undertaking of great importance to Australia. It will serve an area six times as large as Germany with irrigation and navigation facilities, and will provide hydroelectric power for Victoria, New South Wales, and South Australia.

Cost v. Estimate

The sixth generating unit at the Minidoka power plant, Minidoka project, Idaho, comprises a 2,300-horsepower turbine and 3,000 kva. generator, together with an outdoor type switch yard containing a 3,000 kva. bank of transformers for the sixth unit, oil circuit breakers, lightning arresters, etc., for a five-bay structure. The work of installing the sixth unit was done by Government forces. The estimated cost of the work was \$230,000. The actual cost of the installation and switch yard was \$177,774.04. Moreover, several items of expense were added that were not contemplated when the work was undertaken, such as an additional switch yard bay and new roof ventilators.

ON the Kittitas division of the Yakima project, work continued under 12 contracts on the construction of Easton Dam, about 22 miles of the Main Canal, 1 mile of the North Branch Canal, and clearing of the reservoir site above Easton Dam.

THE cold-storage plant at Okanogan, Okanogan project, was finished in time to handle the pear crop. A lumber company at Omak is constructing a new box plant.

Poultry Development on the North Platte Project, Nebr.-Wyo.

POULTRY raising has become one of the important developments in the livestock industry of the North Platte Valley. On January 4, 1927, the North Platte Valley Cooperative Poultry Marketing Association was organized. Members of this association dressed and sold cooperatively \$80,000 worth of turkeys for the Thanksgiving and Christmas markets. The two shipments totaled 10 carloads, or approximately 20,000 turkeys, 2 carloads remaining on the farms to be sold in February, 1928. The amount received for this shipment brought the total sales for the 1927 turkey crop to approximately \$100,000. Five hundred growers marketed turkeys cooperatively. The turkeys are dressed on the farms and graded by the buyer. In this way the grower becomes familiar with the grading and develops an appreciation of the value of quality. The accompanying tabulation shows the growth of cooperative marketing of dressed turkeys.

The highest record was made by a member of the association who raised and marketed 34 turkeys per hen. From the three hens in her breeding flock this grower marketed \$489.03 worth of turkeys, or \$163 per hen.

The South Sioux Poultry Association was organized in the fall of 1924. This association meets at Henry, Nebr., regularly on the first Tuesday evening of

Year	Number of growers marketing cooperatively	Number of cars sold	Prices received per pound (cents)						Total amount	Net return over live-weight price (estimated)
			Thanksgiving			Christmas				
			No. 1's	No. 2's	O. T.'s	No. 1's	No. 2's	O. T.'s		
1924	219	5	30	22	25	28	22	24	\$27,682	\$7,500
1925	430	8	36	26	31	39	30	34	64,306	12,900
1926	480	9	40	30	35	45	28	40	75,000	13,500
1927	500	10	41	33	36	41	24	36	80,000	15,000

each month. At the meetings timely topics and poultry problems are discussed. It is not unusual to have an attendance of 150 to 200 persons at the meetings. The annual poultry show of this association is held at Henry, Nebr., each year. At the 1927 show more than 353 birds were exhibited. The turkey exhibit was especially good, with 57 turkeys, representing three breeds, entered. In the exhibit of eggs, 34 entries were made and 1,144 eggs were exhibited. The estimated attendance during the two days of the show was 600. Premiums of cash and merchandise, totaling \$250 were given.

In March, 1927, the East End Poultry Association was organized in the community north of Bayard, Nebr. This association is similar to the South Sioux Poultry Association and promises to be as successful.



Hogs raised on irrigated land on the Grand Valley project, Colo.

What Colonization of the Riverton Project Means to Fremont County

A RECENT issue of the Riverton Review, quoting an article by Jack Long in the Pavilion Independent, states that the colonization of the Riverton irrigation project, Wyoming, would mean—

That this area, within such close proximity to Riverton, combined with that already under water in the older irrigated districts, will materially increase the economic strength of the county.

That a large acreage under cultivation will prove attractive to capital, giving opportunity for the establishment of milk and cheese factories, and possibly later, a sugar factory or a cannery for vegetables.

That a large percentage of the livestock which is now shipped out of the State to the feed yards in Nebraska and Iowa, can be held in this county to utilize the hay and by-products of root crops which are produced on local farms.

That there will be an increased demand for labor during winter months.

That the entire county will prosper as other dairy and stock feeding sections have.

That there will be a large acreage of irrigated land added to the tax rolls.

That every individual in the county will benefit either directly or indirectly, and every man, woman, and child who is interested in the development of Fremont County should acquaint themselves with the advantages of their community and give full cooperation to Federal and State officials who are giving their best efforts to further enrich the county through the development of its natural resources.

Sarda Canal in India Is Nearing Completion

According to a recent news item in the Christian Science Monitor, the Sarda Canal in the United Provinces, India, is nearing completion. The canal will be about 4,000 miles long, including all its distributaries, and is designed to carry 9,590 second-feet.

The canal will command about 7,000,000 acres of land, of which 1,500,000 acres will be irrigated.



A heavy yield of irrigated pears on the Yakima project, Wash.

Newlands Dairy Cows Bring Good Returns

The following statement, based on records, kept by the Department of Farm Economics of the University of Nevada, of 11 herds totaling 224 dairy cows on the Newlands project, Nevada, shows the average cost, average gross return, and average net return per cow:

Cost of and returns from average dairy cow, Newlands project

Feeds:	
Roughage.....	\$50.32
Pasture.....	3.83
Mill feeds, grains....	.98
Miscellaneous.....	1.44
Feed for bull.....	3.36
	<hr/> \$59.93

Cash costs:	
Veterinary and Medium.....	.99
Miscellaneous.....	.89
	<hr/> 1.88

Interest at 6 per cent on:	
Cows.....	6.94
Buildings, equipment, etc.....	1.59
Sire.....	1.15
Overhead.....	2.06
	<hr/> 11.74

Miscellaneous charges:	
Taxes.....	1.13
Buildings, equipment	2.99
Sire.....	.73
Net depreciation....	7.81
Overhead.....	5.53
	<hr/> 18.19

Horse labor at 12 cents per hour:	
Chores.....	.84
Buildings, equipment	.18
Sire care.....	.15
Overhead.....	.48
	<hr/> 1.65

Total.....	93.39
Income, butterfat sales....	107.12
Income, other credits....	37.80

Total.....	144.92
Average labor income.....	51.53

Farm Budgeting

A farm budget is a carefully worked-out plan based on estimates as to how well a particular combination of crops or combination of crops and livestock will pay. These estimates are based upon the available information as to what the prices and crop and livestock production are likely to be during the year or period of years just ahead. Although prices, crop yields, and livestock production can not be forecast exactly, they can be foretold within broad enough limits to make it profitable to organize carefully and to focus attention upon the best available information relating to them. A method of doing this is outlined in Farmer's Bulletin No. 1564.

North Platte Project Adds Purebred Stock

During July five cars of dairy cattle, consisting of 133 head, were shipped in by the North Platte Valley Dairy Development Association. Charles Kearney & Sons, of Morrill, Nebr., also shipped in five purebred registered Jersey heifers obtained at the dispersal sale of the Midforks purebred Jersey herd at Macon, Mo. These heifers are daughters of the great herd sire Majesty's Gamboge Lad, 3d, which sold for \$5,000, and three of the heifers are out of the three highest testing cows in that great herd. The other two have for dams two splendid producing cows of Majesty and Golden Fern's Lad breeding. Some time ago Messrs. Kearney & Sons shipped in a pure herd bull, Killingly Owl Prince, sired by Killingly Owl Interest, stated to be a world champion sire which has sired a string of daughters having an average production far in excess of that of any Jersey herd, living or dead.

Alfalfa Production Cost on Newlands Project, Nev.

According to figures compiled by the University of Nevada, based on 17 farms, the cost of producing alfalfa during 1927 was \$8.74 per ton, or \$33.44 per acre, distributed as follows: Value of horse labor, \$3.41 per acre, 89 cents per ton; seed, 38 cents per acre, 10 cents per ton; cash costs, 10 cents per acre, 3 cents per ton; miscellaneous costs, \$6.33 per acre, \$1.65 per ton; interest at 6 per cent, \$11.50 per acre, \$3.01 per ton; labor cost, \$11.72 per acre, \$3.06 per ton. The yield on the 17 farms was 3.82 tons per acre.

Newlands Poultrymen Get More for Eggs

The organization of the poultrymen on the Newlands project, Nevada, enable the producers this season to get 5 cents a dozen more for eggs than under the old haphazard system of marketing. On a production of 3,000 dozen eggs a day, which is the average on the project, the extra 5 cents per dozen brings to those engaged in the poultry business about \$150 a day extra, an item well worth considering and an accomplishment that is worth all it cost in money and effort, and a good deal more.

A NEW cottonseed oil mill is being proposed for construction at Las Cruces, Rio Grande project. Farmers have subscribed 51 per cent of the stock.

Colorado River Bed Dry at Andrade

On August 24, 1928, for the first time in several years, the Colorado River bed was dry below the new sand dam near Andrade, which diverts the entire stream into Imperial Valley for irrigation purposes, according to an article in the Yuma Morning Sun.

William Wisener, watchman for the Yuma Water Users' Association, stated that in the 14 years he has been on the project this is the third time he has seen the river bed dry.

Cumulative Crop Value Over Billion Dollars

During the 22 years from 1906, when water was first available for the irrigation of land on the Federal reclamation projects under the Bureau of Reclamation, to 1927, inclusive, the gross value of the crops grown on these projects and on adjacent land served with water under Warren Act or other water-service contracts from the Government irrigation works, has amounted to \$1,337,428,010.

Beginning with the relatively small crop value of only \$244,900 in 1906, the values mounted steadily each year until the war peak of \$152,978,400 was reached in 1919. This was followed by a decline during the deflation period to \$83,601,690 in 1922, after which values rose steadily to \$131,264,730 in 1925, but dropped to \$110,414,940 in the following year owing largely to the slump in the price of cotton. In 1927 the gross crop value reached \$133,207,210, the highest point since the war peak of 1919.

Alfalfa

The following history of alfalfa is from a book under that title by F. D. Coburn, secretary, Kansas Department of Agriculture, published in 1909:

Alfalfa, or lucerne, has been cultivated since civilization, and was familiar to the Egyptians, Medes, and Persians. It is said to have grown spontaneously in the high dry regions of southern and central Asia, and is mentioned in connection with Persia, Asia Minor, Afghanistan, Beluchistan, and Cashmere. At the time of the invasion of Greece by Xerxes, about 450 B. C., alfalfa became known in that country, and preceding the Christian era was prominent in Roman agriculture. The Romans esteemed it highly as forage for the horses of their armies, and its cultivation has been maintained in Italy to the present time. From Italy it was introduced into Spain and southern France, and was carried to Mexico during the Spanish invasion. When the Spaniard turned his attention to the lands of the Incas, alfalfa found its way to the western coast of South America, where, escaped from cultivation, it is said to be yet found growing wild over large areas. There, in the semiarid regions of the Andes, it no doubt received a great strengthening of its already strong tendency to survive in a scorching sun upon a parched earth. From Chile it reached California in 1854, and there, mainly under irrigation, flourishes to-day as perhaps in no other place in the world. It rapidly spread eastward, and is now grown largely throughout the humid as well as the arid and semiarid regions of the western States and Territories, while gradually finding favor farther east.

Eastward from the Pacific coast was not, however, the only route of introduction of alfalfa into America. It was early known in Germany and other northern countries of Europe, but never became so popular there as farther south. As early as 1820, years before it reached California, it was grown in New York, but seems to have been little appreciated.

It is interesting to know that such old-time agricultural authorities as Columella and Jethro Tull were familiar with alfalfa. French lucerne was introduced into England as early as 1650, but seems to have been much neglected for many years. In 1765 a farmer in Kent had 14 acres.

These statements are interesting from the fact that so many consider alfalfa a new plant.

More than 100,000,000 pullets are needed yearly to take the place of the mature hens retired from the flocks and marketed because they have passed their prime as egg producers.



Irrigate 1 sugar beets, Milk River project, Mont.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, who has been accompanying the Secretary of the Interior on a trip to several of the northern projects, expects to return to the Washington office about the middle of October. On October 4 he planned to address the meeting of the American Society of Civil Engineers at San Diego on the subject of reclamation policies. Later in the month he plans to visit the lower Rio Grande.

R. F. Walter, chief engineer, during a recent field trip by automobile covered 6,000 miles in 45 days and visited 12 projects. Inspection was made of the large construction work now being done by the bureau.

George C. Kreutzer, Director of Reclamation Economics, who accompanied Secretary West and Doctor Mead on a recent inspection over several of the northern projects, later visiting the Belle Fourche project, returned to the Washington office on September 17.

Among the month's visitors on the Kittitas division of the Yakima project were Paul Jarvis, superintendent of the Pioneer Sand & Gravel Co., Seattle, Wash.; District Engineer Simpson, of the State highway department; and F. T. Crowe, representing Morrison-Knudsen Co.

Fred H. Bette, senior engineering draftsman, Kittitas division, Yakima project, has been appointed assistant engineer with the Bureau of Indian Affairs.

Sr. Adolfo Orive Alba, a graduate in civil engineering from the Escuela Nacional de Ingenieros, of Mexico City, who has been commissioned by the Mexican Government to spend a year in the United States to study irrigation engineering, spent several days recently on the North Platte project.

Recent visitors on the Boise project included George C. Patterson, chief clerk of the Minidoka project; Walter Blomgren, engineer in the Indian Service; Mans Coffin, manager of the Salmon River project; and F. A. Banks, construction engineer of the Owyhee project.

S. L. Jeffords, special investigator of land reclamation and settlement, is employed in the Washington office in connection with the study of opportunities for planned group settlement in the South.

Dr. Alvin S. Johnson, professor of economics in Columbia University, has been appointed economic expert in the bureau to make a study of and report on economic conditions on a number of the projects.

George C. Bonnet, head of the appointment division of the Denver office, has been detailed temporarily to Washington to assist the Personnel Classification Board in the classification of field positions of the bureau.

Col. B. F. Fly, of Yuma, and particularly of the Yuma Mesa, is again in Washington and is a frequent and welcome visitor at the Washington office.

L. M. Lawson, superintendent of the Rio Grande project and chairman of the International Boundary Commission, was a recent visitor on the Yuma project.

George A. Scott, livestock statistician of the Department of Agriculture, working in cooperation with the California Department of Agriculture, called at the Orland project office recently for data relative to the production of turkeys on the project.

H. F. McPhail, engineer from the Denver office spent several days on the Orland project supervising the final installation and the preliminary operation of the electrical equipment at Stony Gorge dam.

Mr. Glenn, superintendent of the Montezuma Valley Irrigation Co., at Cortez, Colo., visited the Uncompahgre project recently to investigate the use of drag-line machines for cleaning canals and laterals.

E. L. Sutherland, junior engineer, and N. L. Walker, instrument man, have been transferred from the Rio Grande to the Carlsbad project.

Prof. Edgar H. Neal and Prof. A. G. Edgar, of the Agricultural College of the University of Idaho, were on the Minidoka project during the month to discuss irrigation and drainage practices on the project.

G. N. Houston, superintendent of operation and maintenance for the Canadian Pacific Railway, and D. G. MacCrea and M. F. R. Lloyd, canal superintendents of the Lethbridge Northern Irrigation project, made an inspection recently of some of the important features of the canal system on the Sun River project, later visiting the Gibson Dam.

R. K. Tiffany, former project manager of the Yakima project and now State Supervisor of Hydraulics, was a recent visitor on the Yakima project.

Orville I. Craft, recorder of surveys, has been transferred from the Rio Grande project to the Kittitas division of the Yakima project.

Dr. Phil. Albert Volkart, professor at the Swiss Technical High School in Zurich, Switzerland, and Director of the Swiss Experimental Station for Agriculture, Oerlikon, Zurich, accompanied by his son, spent two days recently on the Rio Grande project.

Recent visitors at Echo Dam, Salt Lake Basin project, included A. P. Bigelow, president, and 30 delegates from the Weber River Water Users' Association; K. C. Wright, State road commissioner of Utah; B. W. Matteson, Bureau of Public Roads; and R. F. Hoffmark, of A. Guthrie & Co. (Inc.).

Capt. C. R. Trowbridge, inspector, visited the Washington office on his way to Habana, Cuba, for a short vacation.

PRELIMINARY negotiations are being carried on by the city of El Paso looking to the possible purchase by the city of a water supply from Elephant Butte Reservoir, Rio Grande project, by acquisition of rights for 4,000 acres within the El Paso County Water Improvement District No. 1.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent;
C. A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Younghlutt.....	J. P. Sieheneicher.....	-----	Wm. J. Burke.....	Mitchell, Nehr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	-----	B. E. Stoutemyer.....	Portland, Ore.
Carlshad.....	Carlshad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	-----	-----	-----	-----
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	-----	-----	-----	-----
Klamath.....	Klamath Falls, Ore.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Schepplmann.....	E. E. Chahot.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	-----	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Ore.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	-----	Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nehr.....	H. C. Stetson.....	Virgil E. Huhbell.....	Virgil E. Huhbell.....	Wm. J. Burke.....	Mitchell, Nehr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	W. D. Funk.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Ore.
Orland.....	Orland, Calif.....	R. C. E. Weher.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Ore.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Ore.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nehr.
Salt River ⁷	Phoenix, Ariz.....	C. C. Cragin.....	-----	-----	-----	-----
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	-----	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....	-----	-----	-----	-----
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Ore.....	A. C. Houghton.....	-----	-----	-----	-----
Uncompahgre.....	Hermiston, Ore.....	Enos D. Martin.....	-----	-----	-----	-----
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Ore.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Ore.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
-----	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Phlehaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹²	E. R. Mills.....	-----	B. E. Stoutemyer.....	Portland, Ore.
Sun River, Gihson Dam.....	Augusta, Mont.....	Ralph Lowry ¹²	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Damsite, Elk Creek, Calif.....	H. J. Gault ¹²	C. B. Funk.....	-----	R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Denver, Colo.....	-----	Middle Rio Grande conservancy district.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	-----
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	-----



ECONOMIC DEVELOPMENT ON THE BELLE FOURCHE IRRIGATION PROJECT, SOUTH DAKOTA

1. Cutting first crop of alfalfa. 2. Holstein dairy cattle on Indian Creek Canal. 3. Irrigating sugar beets. 4. New set of buildings on farm owned by State Banking Department. 5. New set of buildings on farm owned by a nonresident. 6. New set of farm buildings erected by a well-established resident owner

NEW RECLAMATION ERA

VOL. 19

NOVEMBER, 1928

NO. 11



THOUSANDS OF THE HOLIDAY BIRDS ARE MARKETED FROM THE FEDERAL IRRIGATION PROJECTS EACH YEAR

CONSTRUCTION RESULTS

BUREAU OF RECLAMATION

To June 30, 1928

Storage and diversion dams - - - - -	118
Reservoir capacity (acre-feet) -	12,829,523
Canals, ditches, and drains (miles) - - -	16,413
Tunnels - - - - -	118
Length (feet) - - - - -	164,083
Canal structures - - - - -	146,164
Bridges - - - - -	11,332
Length (feet) - - - - -	269,520
Culverts - - - - -	13,521
Length (feet) - - - - -	509,779
Pipe (linear feet) - - - - -	3,931,310
Flumes - - - - -	4,693
Length (feet) - - - - -	842,929
Power plants - - - - -	35
Power developed (horsepower) - - - -	166,103
Telephone lines (miles) - - - - -	3,350
Transmission lines (miles) - - - - -	1,915
Excavation (cubic yards) - - -	266,826,132

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.
Price, 75 cents a year

ROY O. WEST
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

November, 1928

No. 11

Interesting High Lights on the Federal Reclamation Project

STONY Gorge Dam, Orland project, is practically completed except for removal of plant and equipment and cleaning up, the percentage of completion being 99.75 at the end of the month.

A CONSIDERABLE area of vacant land on the Grand Valley project has gone to tax sale and into the hands of a foreign corporation, which is planning to improve several farms and sell them under long-term contracts. This will necessitate the erection of houses and should help materially in the improvement of the project.

A CARLOAD of clover seed, shipped recently from Rupert, Minidoka project, was reported sold at 26 cents a pound, with a gross return of \$10,000.

A HOLSTEIN bull association is in process of organization on the Minidoka project, including about 25 dairy farmers in the vicinity of Rupert. It is planned to purchase animals of the highest quality obtainable.

SHIPMENTS of wheat from points on the Milk River project were larger during September than those of any previous month of record, a total of 770 cars or approximately 1,100,000 bushels being moved.

AT THE Owyhee Dam, Owyhee project, work continued on the diversion tunnel, vertical spillway shaft, and in stripping loose rock from the canyon walls around both abutments. Erection of the construction camp was in progress.

ON THE Belle Fourche project early estimates of the sugar beet crop are being revised upward, the yields running from 16½ tons per acre to as high as 20 tons.

AT Gibson Dam, Sun River project, 16,300 cubic yards of concrete were placed during the month bringing the total to 117,400 cubic yards, with 43,000 cubic yards remaining to be placed.

DURING the latter part of the month a large number of feeder lambs were received on the North Platte project, the indications being that a large amount of feeding will be done during the winter. Nearly 100 cars of sheep have been shipped to the project over the new line of the Union Pacific Railroad extending from the project to the main line near Cheyenne, Wyo.

A NEW 35,000 bushel grain elevator has been completed at Morrill, Nebr., North Platte project. The building is 105 feet high and has been equipped with modern elevator machinery. Work has begun on the construction of a new creamery at Mitchell, Nebr., and also on the construction of a 2-story building at Scottsbluff, Nebr., to be occupied by the North Platte Valley Hatcheries. The incubators will be operated by electricity and the total capacity will be 48,000 eggs.

THE Yuma Chamber of Commerce and the Kiwanis Club are endeavoring to arouse sufficient public interest in Fly Field, the local airport adjoining unit B of the Mesa division, to raise funds for necessary improvements, such as oiled runways, lighting and water systems, and accommodations for pilots, in order to bring the field to a class AAA standing. The Army is planning to establish a meteorological station at the field and will take daily observations of wind movements and temperature at various altitudes.

A CENSUS of the turkey crop on the Newlands project shows about 58,000 birds for the market. This is an increase of about 23 per cent over last year.

THE Belle Fourche Reservoir is being groomed as a fishing resort by local and State authorities. The seining of rough fish is progressing favorably with the low water in the reservoir, and about 50,000 pounds of carp are being taken out each week under supervision of the State. When this work is completed the lake will be stocked with black bass.

THIS year's crop has broken all previous records for shipment of fruit and vegetables from the Yakima Valley. During the first 28 days of September shipments totaled 6,048 carloads, 1,328 of which were apples, pears, and potatoes, the apple billings exceeding 100 cars a day during the last week of this period. Loadings for the season totaled 10,196 cars. Potato shipments were more than 100 per cent greater than during the corresponding period in 1927 and shipments of apples and pears were almost double those of last year.

THE water users on the Riverton project made a very creditable showing of agricultural products at the Fremont County Fair at Riverton and at the Wyoming State Fair at Douglas. Fremont County won the sweepstakes on potatoes at the State fair, most of which were raised on the Riverton project.

THE Reno Chamber of Commerce, through its board of directors has voiced objections to the resolution suggested by the Chamber of Commerce of the United States recommending "the postponement of further reclamation projects until demonstration is given for the need of additional production."

THE settlers on the Willwood division of the Shoshone project held a meeting recently to organize a stock-growers' association primarily for the purpose of securing grazing land for sheep.

A National Reclamation Policy

DURING the past two years a committee of the American Society of Civil Engineers has been investigating Federal reclamation with a view to formulating a reclamation policy. The committee has completed its report, which was submitted at the half-yearly meeting of the society at San Diego, Calif., October 4, 1928. Prior to the meeting it was disseminated widely throughout the United States. Newspaper comment and resolutions passed by farm organizations show

that the present situation of Federal reclamation is not understood. The poverty of settlers and delinquencies in payments are dwelt upon, and the idea seems to prevail that Federal reclamation is a losing venture for the Government.

Dr. Elwood Mead, Commissioner of Reclamation, was invited to attend the meeting of the society and to present the views of those administering the reclamation act. His statement was intended to show what those administering the

Bureau of Reclamation regard as the actual situation and the needs of the future. The discussion is of such importance to the Nation that both the report of the committee and Doctor Mead's address are printed. Comments by water users and others interested in these vital problems are invited. Selections from those received will be printed in future issues of the ERA.

Report of Committee of the Irrigation Division of the American Society of Civil Engineers

BY resolution the committee limited its work to a study of policies governing the reclamation of arid lands and related matters.

The policy of the United States and of the several States in the matter of water conservation and arid-land reclamation should be controlled by certain basic principles as follows:

1. The waiving of interest payments to landowners on Government reclamation projects is unwise. In the future, Government contributions should appear in the assumption of a part of the cost of project works and not in the granting of relief to the individual farmer such as the waiving of interest charges.

The United States Bureau of Reclamation has formulated a program of construction covering the ensuing 10 years involving expenditures of approximately \$100,000,000. To the extent that commitments have been made it should fulfill its assumed obligations and on the other hand the landowner should be required to meet his obligations or surrender his holding in the Government project.

2. The conservation of the water in the rivers and lakes of the country should be under public control and in order to lay a proper foundation for the making of comprehensive plans the Federal and State Governments should gather data, compile statistics, and conduct studies necessary to determine the feasibility of projects.

3. The regulation of the flow of streams for the prevention of floods and for the best possible utilization of the waters should be undertaken by the States, or jointly by the United States and the States under such suitable forms of cooperation as may be appropriate under the constitutional authority now delegated to each. They should prepare and adopt compre-

hensive plans for such regulation and should bear an equitable portion of the cost of water-storage and flood-control work when the economic aspects after full investigations are found to be favorable, and the remainder of the cost should be allocated to flood control, irrigation, power development, municipal water supply, and other purposes.

4. Where protection against flood waters results from the regulation of stream flow by means of reservoirs or otherwise, the proportion of the cost of the flood-control work not assumed by the Federal or State Government should be assessed against the lands and other properties which receive benefit therefrom.

5. Municipalities or other public agencies or private parties should be allowed to construct approved projects in conformity with the approved plans, subject, however, to public control of reservoirs and subject to the recapture after a reasonable time by the public of any franchise or similar rights conferred on private parties.

6. The output of power and of water at Federal or State works should be disposed of at wholesale and not at retail.

7. Interested States under suitable interstate compacts should be permitted by the United States to undertake the regulation of interstate streams.

8. In the carrying out of further stream-regulation work preference should be given to the construction of regulating reservoirs and the development of supplemental water supplies for existing irrigation systems, whether Federal or otherwise.

9. Agricultural conditions due to overproduction are such at present that it is undesirable for the Federal Government,

except in the case of commitments already made, to bring new areas under cultivation.

10. The construction of new irrigation projects should not be authorized except after thorough investigation and favorable recommendation by a board of review. This board should include competent construction engineers, engineers with special operating and agricultural experience, economists, and financiers familiar with local production and marketing conditions. The State shall share in the responsibility for the selection and approval of projects. In determining the feasibility of proposed projects, State lines, local interests, and political expediency should not control.

11. When new projects are authorized, principal and interest payments on construction costs should be required of the landowner. The interest rate should be low and the principal payments extended over a long period with no payments on principal during the early years.

12. The plan of repayment of construction costs of reclamation should be put into operation on each unit of the project at an early date after completion. The plan of payment should be sufficiently elastic to meet the settler's ability to pay, but no relinquishment in the terms of repayment once they are put into effect should be permitted.

13. In the case of reclamation projects, it should be recognized that settlement of the land is fully as imperative to success as construction. It can be greatly stimulated by the Government or other authorities taking drastic measures to prevent land speculation. The Department of the Interior is to be congratulated on its efforts to curb land speculation in recently authorized projects.

14. Land settlement, including paternalistic, financial, or any other kind of assistance to the individual farmer, should be treated as a local matter and should therefore be made the concern of the State or locality rather than of the United States. Aid extended by Federal land banks has been generally helpful and the

possibility of further extension of such aid by this or similar agencies is worthy of serious consideration.

15. The Federal Government should continue its present policy of relinquishing control of completed works to suitably organized local agencies as soon as practicable.

16. According to the report of the United States Bureau of Reclamation for 1926, the total area of land provided with water for irrigation was 1,803,000 acres in reclamation projects, of which 1,320,000 acres were being cultivated by irrigation—a record of which the country may well be proud.

Some Economic Aspects of Federal Reclamation

Address by Dr. Elwood Mead, Commissioner of Reclamation, at the meeting of the American Society of Civil Engineers, San Diego Calif., October 4, 1928

Reclamation of Arid Lands Is a Complex Undertaking

THE reclamation of arid land by irrigation is not a single or simple undertaking. It involves the construction of works, which is engineering. It requires the settlement and cultivation of land, which is economics. It is not a success unless it creates communities of happy, prosperous homes, which is a social problem. The report we are considering was prepared by engineers. If it had been prepared by economists more attention would have been given to settlement and the creation of conditions which would enable the money spent on construction to be repaid. If it had been written by settlers, more would have been said about their needs.

Investigations and discussions like those inaugurated by this society will therefore promote an understanding of reclamation and make future development even more valuable.

The influence of Federal reclamation on agricultural development has varied widely in different States. It has been least in California and greatest in Idaho and Arizona. The rich and populous irrigation districts of the two States last named are the creation of Federal works. Outside of California important irrigation works of the future will be built by the Government. Costs are too great and needed income will be too long delayed to make such development attractive to private enterprise. Government projects must continue to be subsidized either through not requiring interest on construction costs, as at present, or by the Government paying a part of the cost, as is proposed in the committee's report.

The present income for building Federal irrigation works comes from four sources: Payments by water users, payments for power, income from sales of public lands, and a percentage of the income from oil leases. The first two are increasing. The last two are diminishing. The total is about \$10 000,000 a year.

Works being built are large and costly. Their completion will require several years. Farm development must await the water supply, hence there is small prospect of any material increase in irrigated acreage during the next decade. No contracts for new construction can be made until approved by both the Secretary of the Interior and the President. This operates as a further check on rapid development.

THE SECOND STAGE IN RECLAMATION

There is a gap in reclamation between the completion of canals and the use of water in irrigation. The first step in reclamation is to provide water. The second step is to bring it into use. This requires settlers for the uncleared, unlevelled land. It requires preparing that land for irrigated culture, the erection of farm buildings, and growing crops on soil baked for centuries. The cost, the hardships, and anxiety of this second step were always greater than was realized or admitted and it is now two or three times what it was 15 years ago. An irrigation canal with unpeopled farms below it is a liability, not an asset. Income and the benefits of reclamation are realized only when the second stage of reclamation is completed.

Other obstacles to carrying out settlement and farm development have become more serious in recent years. The pioneering spirit which led settlers to do the difficult and unremunerative work of clearing and leveling land is gone. The open country no longer appeals as it once did. The opportunities of other industries are much broader. The cost of changing raw land into farms is now so heavy that money or credit is usually needed to supplement the settler's meager capital. Economic surveys of our developing projects made by committees which included practical irrigators, economic experts from agricultural colleges, and

representatives of the bureau show that from \$5,000 to \$10,000 must be spent to provide the permanent improvements and equipment of an 80-acre farm.

The percentage of homeseekers with capital enough to improve and equip their farms without borrowing is very small, and the number willing to invest their capital in a development of this character is still smaller. They can get more for their money by buying improved farms in established districts. For the settlement and development of unimproved, unpeopled areas we must look largely to tenant farmers, to whom the lure of ownership is strong, and to the sons of farmers. Such applicants rarely have over \$2,000 to \$3,000, and settlers with less than \$5,000 capital will need to borrow money to make their farms produce a living income. There are few projects where this money can be borrowed on terms which the farmer can meet, if it can be borrowed at all. On nearly all developing projects loans are for short time, with interest rates which are higher than agriculture can stand.

On four projects, which have been in operation for more than 10 years, those who have improved farms are prospering, but more than half the land is unirrigated, and 800 more settlers are needed to bring all the land in these projects under cultivation. If half this number of settlers could be secured it would insure the economic solvency of the Government works and the payment of the Government's debt. These settlers could be secured if there was some agency to loan money needed to erect inexpensive farm buildings and prepare the land for irrigation. They can not be secured without some credit aid not now provided. Short time loans to buy livestock can be secured, but money for permanent development is not available.

I have dwelt on this credit phase of settlement because it is a stumbling-

block in the way of success. It is also a menace to the solvency of works now building or to be built. On one project, where the irrigation works will cost \$11,000,000, there is no anxiety about the payment of construction costs on more than half the area. The farms are improved; the land has been prepared for irrigation. The owners have contracted to pay full construction costs on their entire area; cultivation and use of the water are assured. But on the unimproved, unpeopled part of this project, the surface of the land is uneven and covered with brush or with second-growth timber. To prepare this land for irrigation, provide the necessary buildings and equipment, will cost from \$75 to \$150 an acre. If the cost of making this land ready for cultivation could be advanced and spread over 20 years, with 5 or 6 per cent interest, buyers for this land could be secured, but they will be reluctant to take on a clearing and leveling job.

This project presents new economic problems, the solution of which needs new policies and new laws. Some of the land belongs to the State, some to a railroad, some to individuals, and some to the United States. If these owners act together and the preparation of the land for cultivation is put into competent hands, and farm boundaries fixed to agree with the topography of the country, the land can be made ready for cultivation in less time, at less cost, and with infinitely better results than can be accomplished if we leave this to the action of the separate owners. Each will wait on the others, development will be delayed, and money lost. The heaviest loser would, of course, be the United States.

On another project the irrigation works being built have an estimated cost of \$18,000,000. A considerable part of the land under the project is now being irrigated from pumps. The cost of pumping has so increased in recent years that it is now greater than irrigators can afford to pay. A gravity supply will be much cheaper. The works will therefore avert failure of settlers and bankrupt communities. There is no anxiety about water payments where the lands are settled and improved. Payments will begin and the water will be used as soon as it is available. But there is a financial problem on 70,000 acres of unlevelled, uncleared, and unoccupied land which forms a part of the scheme. The owners of this land are widely scattered. Hardly any of them expect to become irrigators. They wish to sell. There is little danger of inflated prices. The land has been appraised and owners have agreed to sell at the appraised price, which is nominal. But cheap land does not insure settlement and

cultivation. Here, as in the other case referred to, credit and coordinated action are necessary. Part of the land is owned by the State; part by purchasers of State land grants; part by men who acquired it under the homestead, grazing, and similar acts. A small fraction is owned by the United States. If we wait for these independent agencies to improve and develop these farms or find settlers to do it, it will be many years before the water made available is used and before construction costs are returned to the reclamation fund.

Anxiety in regard to the financial outlook is met by the statement that the Government is protected in the repayment of its expenditure by district contract. It is true that all the lands in these projects are obligated to pay the entire construction cost and this obligation is a first lien on all the land, but it would impose an undue burden on the developed lands to require them to pay the charges against the undeveloped lands. A part of the project could not carry the cost of the whole. We know as a practical matter that solvency and settlement are closely related.

The measures for aiding settlers in farm development, suggested in the committee's report, are entirely inadequate. State aid has been sought. Legislation to require this has been considered in congressional committees, but investigation showed that some States lack the means to extend this aid, some are prevented from doing so by constitutional prohibitions, and in every State there is small prospect of political support for this cooperation. The Federal land bank has not been, nor is it likely to be, of any assistance in changing raw land into farms. It does not loan money except on income-producing farms, and that means loans are withheld until after the problems of settlement and farm development have been solved.

There is great reluctance in Congress to do more than the Government now does. The reasons for this reluctance are not to be ignored, and I wish that further action could be avoided and that we could find settlers with money enough to make their own improvements and buy their own equipment. I see little hope of this on some of the older projects or on some of those now building, and it is my conviction that we should do one of two things, *either provide aid in carrying out the second stage of reclamation, or quit building canals to irrigate unimproved land.*

The latest economic report on settlement and farm development recommends that the Government purchase all privately owned, unimproved land on a project before construction begins. If

this were done, it would forestall land speculation, enable roads and ditches to be laid out to meet the needs of irrigation, and prevent the imposition of heavy State and county taxes before development is completed. Whether this action is taken, it is desirable that the States be more cooperative than in the past. The rule now is to raise taxes as soon as construction begins. This imposes a burden on the owners of partly improved farms that makes payment of construction costs difficult and sometimes impossible. The heavy tax burden is one of the arguments used for political action in writing off or postponing payment of construction costs.

A bill now before Congress is intended to provide a laboratory test of aid and direction in settlement. It authorizes the appropriation of half a million dollars from the reclamation fund. It limits the expenditure on any single farm to \$3,000 and restricts loans to provide for the erection of farm buildings and the preparation of land for irrigation, the money thus advanced to be secured by a first mortgage on the land and to be repaid with interest in installments extending over 20 years. If anything is done it should be done with care. If the half million is authorized, not more than \$100,000 should be appropriated in any one year, and no further authorization should be made until at least half of these advances has been returned to the reclamation fund. This might be arranged through loans to settlers from the Federal land bank. Improvements made from these advances would make Federal land bank loans possible.

There is also a fear that lending money to settlers would lessen their initiative and self-reliance and tend to make them leaners on the Government. That objection was made to the Federal land bank legislation. The same objection applies with greater force to building canals by the Government. We might say let settlers build their own canals and reservoirs. The answer is that this is impossible because of their cost. The high cost of changing raw land into farms makes it impossible for worthy, industrious home seekers to get started without aid. There is a kind of aid which does undermine independence and self-reliance, and another kind which strengthens hope and inspires effort. That is what wisely-directed credit in farm development would do.

ACHIEVEMENTS OF FEDERAL RECLAMATION IN COMPLETING PRIVATE DEVELOPMENT

Let me now call attention to the gratifying social and economic results which have followed the Government's activities

in supplementing or completing district or private development. By taking over the canals of Salt River Valley and building the Roosevelt Reservoir, Federal reclamation rescued discouraged and helpless irrigators and made Salt River Valley, Ariz., one of the most prosperous irrigated sections of the country and a great economic asset of the State. Without similar action the Carlsbad project in New Mexico would now be only a memory. In the Weber Valley in Utah a reservoir is now building to furnish water for late irrigation to intensively cultivated land. It will more than double the value of the crops grown. This additional water supply may be likened in value to the water which puts out a fire. It will save disastrous losses in dry seasons and make possible greater profits in all seasons. There is no worry about the payment of construction costs. The water will be used and the payments made according to contract. The Government has built 2 reservoirs on Snake River, 1 in Wyoming, 1 in Idaho. It is difficult to state adequately the contribution this has made to the success of irrigated farming in Idaho. Only the Federal Government could have coordinated the different interests necessary to carry out a scheme extending over State boundaries. A part of this stored water is being used to give an additional water supply to 80,000 acres of land first developed and settled as an irrigation district enterprise. After farms had been improved and prosperous towns had grown up, it was found that the water supply was inadequate and ruinous losses from failure of crops were suffered in dry seasons. Towns were shrinking in population and business; farms were being abandoned. The Government by providing what was impossible to local effort, has restored confidence and prosperity. In the Snake River development there is no uncertainty about the repayment of Government cost. A part was repaid in advance by the water users.

The improvement of old development and complete utilization of resources in land and water through an entire drainage area, are being carried out in the Yakima Valley, Wash. This kind of development is specially suited to the Federal Government. It is solvent and beneficent and there is a broad field for its extension.

The passage of the adjustment act in 1926, inaugurated a new era in Federal

reclamation. The necessity for this legislation grew out of the hard times which followed the Great War. It made it impossible for farmers on some projects to meet their payments. When owners of improved farms in Iowa and Illinois were being sold out, farmers on partly improved farms, under reclamation canals, found their expenses greater than their incomes. It was impossible for them to recover under existing contracts. Congress recognized this situation and passed an act under which the annual payments of indebtedness in some districts were extended from 20 to 30 and 40 years. The land in all projects was classified in accordance with scientific soil surveys, payments on unproductive lands were canceled, land injured by seepage or which, from other causes, would not at the time grow profitable crops, was given temporary relief from payments. The loss to the Government from this action has been greatly exaggerated. The permanent loss was estimated at \$14,667,965. Some of this will be recovered. The temporary loss was fixed at \$12,788,406. There are hopeful indications that a large part of this will be paid.

Delinquent payments were added to the construction debt. The Reclamation Bureau was authorized to employ economic experts and practical advisers. The foolish idea that anyone could succeed as an irrigation farmer was discarded and provision made for examining home seekers by a local board. This has proved a protection to the inexperienced and oversanguine and is giving reclamation a fair chance to show its value. The Secretary has required settlers to have not less than \$2,000 in money or equipment, and this leads them to investigate more carefully what developing a farm will cost and to plan their operations with more care.

This act authorizes the transfer of projects or parts of projects to the water users. Eighteen districts under 10 projects have been turned over to local control in the last two years. Where this is done the Government is relieved from any further expense for operation and maintenance. These changes have promoted co-operation and good feeling between water users and the Government. They have improved the morale of projects and helped to increase construction payments. Last year these payments were more than \$1,000,000 greater than in any previous year. Delinquencies once so alarming

have almost disappeared. Farm practices are improving. More valuable crops are being grown. There are more acres of sugar beets, more dairy herds, more farm flocks of sheep, more poultry, and more market gardens. In 1927 the crops produced on the 2,504,046 acres irrigated from Federal works were worth \$133,207,210, which is an average of \$53 an acre, or two and one-half times the average acre value of crops in the United States. The value of this one crop almost equals the whole debt of settlers to the Government. Two such crops will be worth more than the Government has spent on reclamation since the act was passed. Another crop of equal value is expected this year.

To complete existing projects in accordance with the 10-year program submitted by the Secretary of the Interior to the President and Congress two years ago will require about \$100,000,000. As the average income of the reclamation fund is about \$10,000,000 a year, there need be no nervousness about Federal reclamation increasing the agricultural surplus during the next decade. The indorsement in the committee's report of this conservative plan of development and of the other economic changes wrought by the adjustment act is greatly appreciated.

In its limited field reclamation is one of the most difficult activities of the Government. The act requires that all money spent shall be repaid. That is impossible, although the Reclamation Bureau has striven to live up to it. Each new project presents new conditions and requires the overcoming of new obstacles. Dams have to be built in remote localities. The suitability of crops to soils baked for centuries has to be tested. Communities have to be organized and markets established. Reclamation has led to a creation of wealth in land many times the cost of the works. Its contribution to other industries, to commerce and trade, entitles it to a credit and support it has not always received. From one town on a Federal project where 25 years ago there was nothing but range cattle, a single railroad last year did a business of \$800,000. The indirect benefits from reclamation include help given in solving the problems of soils and climate, improving irrigation practices, founding rural communities which are an economic and social strength to the Nation, and creating a wealth in land many times the outlay for works.



Reclamation Project Women



By Mae A. Schnurr
Secretary to the Commissioner



Right Curtains on the Right Windows

THAT there is a time and place for everything is indeed a trite saying, but even so it needs to be remembered when curtains are under consideration. Some rooms call for one effect and some for another, and success goes to the home maker who gets the right curtain effect in the room where it belongs.

For example, large pompous rooms demand heavy velours and tapestry, but a timid little room simply cringes when heavy velours and velvets are forced upon it. There are rooms where even the gay and ubiquitous cretonne is not satisfying. This will be found true especially in dark rooms with few windows or where the windows are overshadowed by a porch.

Nothing can be done to bring a dark room out of its glowering gloom unless the walls are painted or papered a light creamy yellow—the most luminous of colors. This done, the windows are easy. First, forget that overdraperies exist and that you and your neighbor have always thought them an essential part of a good-looking window. Then plan a scheme by which glass curtains can be effectively used alone.

In a living room or dining room a really deep cream or ecru marquisette would be interesting with applied hems of deep blue and with a full valance of the same material also hemmed with blue. A more pretentious effect could be achieved by using silk gauze with ruffles of taffeta in contrasting color. It must be remembered that curtains of that type must be dry-cleaned. One of the secrets of attractive windows without overdraperies is to have the curtains full—skimpiness can not be forgotten or forgiven.

The illustration shows an effective treatment much like those suggested. The material is theatrical gauze and the bands a striped cretonne. Additional dignity is given by having a rod in the hems of the valance at both top and bottom.

Instead of using bands the valance alone may be cretonne and if the glass curtains are ruffled tie backs the tie

backs should also be cretonne. In the bedroom one of the newest ideas is to hang a voile or marquisette panel with a ruffle at the bottom over the glass. Then at each side arrange ruffled tie backs of the same material just as though they were heavy overdraperies. One charming treatment of this kind was in the home of a young bride. The curtain across the glass was a soft delectable pink and the voile curtains at each side were printed with little pink nosegays and ruffled in plain pink.



Curtains of theatrical gauze banded with colored cretonne are effective

Curtaining the Kitchen

Is your kitchen bright and sunny—a cheerful place to work? Do you like the view from the window, or would you rather shut it out? Is the room easy to ventilate? Or does it present such problems as the shadow cast by an overhanging porch roof, or the too close proximity of your next door neighbor's entry, or a northern exposure, seldom visited by the sun? The question of curtains for the kitchen, if one decides to

curtain it at all, hinges on such points as these.

You are tempted to have curtains of some sort because they add a note of cheerfulness and gayety that somehow makes the work seem easier. Any type of curtain you select will need fairly frequent laundering because cookery tends to saturate draperies with greasy steam. Sturdy, washable materials are therefore best. In making up the curtains it is well to run in a tuck near the upper casing to allow for shrinkage. Good fabrics to use are unbleached muslin, gingham, glass toweling, English prints, or Japanese crêpe. Curtains made of any of these may be hung at the sides of the window only, or arranged to draw across it.

Sometimes, as the city dweller knows, a curtain hung close to the window is necessary for privacy. Lightweight but durable fabrics which will admit a good deal of light are scrim, marquisette, voile, or dotted Swiss. The material may be banded with a bright color or it may have a few appliqued motifs on it. Such glass curtains may be full length, or they may be of the Dutch or double-sash type, shirred on rods, to make ventilation easy.

Many variations are possible in kitchen curtains. Checked and flowered hems may be used on plain materials, and plain gingham on figured materials. One of the newest ideas is to make the kitchen shades of the oilcloth which comes in plain cream, rose, blue, and green, and in figured patterns. These shades are mounted on rollers just like an ordinary window shade and can easily be made at home.

Choosing Good Curtains for the Children's Room

When the children are little their bedroom is often their playroom, too. As soon as they are old enough to observe them, children take great delight in the furnishings of the nursery. Curtains for the children's room should be sturdy, simple, decidedly decorative. The colors

and Their Interests



and Associate Editor
New Reclamation Era



in them should be pure in value, rather than dainty pastel shades. These make little appeal to a small child. Because of the need for sunlight and air, glass curtains are omitted unless the situation of the window makes this impossible. For nap time the light may be modified by a dark shade or screen of some sort. One way to effect this is to line the side curtains and arrange them to draw.

Here is an attractive window treatment for a child's room. The curtains are of fast-colored print, in a blue and red pattern, with a blue border on both curtains and valance. The valance and side draperies are hung on separate rods so the draperies can be brought together at nap time. As both walls and woodwork of the nursery are a light warm gray in color, these gay curtains are very attractive. There is a hit-and-miss rug on the floor, mostly red, blue, and gray. Gingham, Japanese crêpe, or appliquéd unbleached muslin could have been used with good effect. Motifs for appliqué may be cut from crêtonne and figured ginghams and color ideas may be taken from the child's favorite picture book.

About Draperies

The fabric and pattern of drapery material should be dignified and simple enough to suit all tastes. If the rug and wall paper are figured or the upholstery decidedly patterned, a plain-colored rep, sateen, lightweight denim, sunfast, or easement cloth would be the wisest choice. If all the surfaces of the room are plain, figured materials would relieve the monotony and create a "homey" appearance. Avoid flower designs that look too natural and are in brilliant colors. Carefully blended tones and dignified conventional designs are more suitable.

Help For The Home Sewer

Texture is a very important consideration when choosing materials for a garment. This is especially true in regard to stout figures; shiny fabrics, even though they are black seem to increase the size

of the wearer. Coarsely woven, thick, or fuzzy materials increase the apparent bulk of the figure. Soft, clinging materials should be chosen for the plump person rather than those which are stiff, such as organdie and taffeta. These may be worn by the more slender, youthful figure. Color, although not a texture, is another important factor. Light and bright colors tend to increase the size while dark neutral colors decrease the apparent size of the wearer.



Good curtains for a child's room

Care in fitting a garment, whether homemade or ready-made, helps to determine its appearance and the way it wears. Badly fitted clothing pulls and gives at the wrong points and is a source of continual dissatisfaction. Much time may be wasted trying to remedy the trouble. A well-fitted, appropriate, becoming suit or dress will give its wearer a look of distinction and trimness.

Commercial patterns are planned for ideal figures, and must almost always be altered to fit the individual user. A knowledge of fitting is fundamental for the home sewer.

The dress form is an advantage in making dresses, especially for the woman who must do her own fitting. She can study the lines best suited to her figure, regulate the length of the skirt and other parts accurately, and determine most of the changes that may be necessary. The final test of the fit of a costume should be made while sitting. It should be perfectly comfortable and no unsightly wrinkles should develop in this position.

A well-fitted garment allows freedom of movement without being too large, and is free from unnecessary wrinkles and folds. The general style of the garment determines whether the fitting should be snug, easy, or loose. Garments fitted moderately loose are best suited to large figures, for tightness emphasizes the curves and makes the figure appear larger. Make any garment too loose rather than too snug. Allow for shrinkage of the fabric when it is cleaned. Underarm seams and center front and back threads of any garment are always perpendicular to the floor. The skirt hangs straight without swinging to the front or to the back. When fitting a garment try the seams in different positions, especially those of the shoulder. Study the figure to find the position which will emphasize the best features and conceal those which are not so good. Put the attention on fitting the figure rather than on keeping the lines of the pattern.

Electricity Acts as Servant On Project Farms

The strides forward that are being made by new inventions are all directed toward making this a better world to live in.

In this generation we can go back to history and read about methods employed in any task and make comparison with present-day methods and these will invariably be found to be much improved. A lot of lost motion has been eliminated by present-day methods, and labor-saving devices have made easier the tasks on the farm and in the home.

If a vote were to be taken among rural communities and farm population as to

what one factor has contributed most to the comfort and pleasure of the community as a whole, or to the individual, I believe electricity would be the answer, as it affords many ways of doing things in an easier and better way.

Think what light alone has accomplished for people in rural communities. The friendliness of light is acknowledged by all. Dislike of darkness is inborn in each of us. It hasn't been very long ago that the practice obtained generally of carrying an oil lamp from room to room to furnish the necessary illumination, then each day these oil lamps had to be cleaned and filled to be ready for night service. This is still done to some extent but is gradually being eliminated.

Electric power saves time and human energy, creates cleanliness, and acts as a well-trained servant subject to your demands, and at a very small cost.

Those of our projects which are fortunate enough to have power plants enjoy all the benefits electricity offers at a low rate.

The long working day on the farm has been shortened by its help, many of the back-breaking chores have been eased, and evenings mean relaxation and solid comfort.

Power companies find it profitable to maintain a special staff of experts to instruct the rural population in the many ways electricity can be of service. This is appreciated and just how much interest is shown may be gleaned by record attend-

ances at the lectures held in the field of activity. New installations mean financial return to the utility company but also mean easier and better ways of doing things.

Project people are progressive. They always have time to listen to how things may be done in a better way.

Some of the finest kitchens I have ever seen were on reclamation projects and with what pride the project women like to show them! While utility is paramount it is effectively combined with attractive appearance and the result is a delightful place to work in. Neighborly visiting of housewives is, to a great extent, carried on in the kitchen, often while some task is being carried out like preserving, canning, etc.

Economic Notes From the Belle Fourche Project, South Dakota

By Otto C. Batch, Associate Reclamation Economist

Sugar-Beet Harvest on the Belle Fourche Project

AT the end of the first 10 days of harvesting the 1928 sugar-beet crop on the Belle Fourche project, indications are that tonnage in every section will surpass the preharvest estimates. The restriction placed on delivery, owing to warm weather, has retarded the general cleaning up of early beets, but the fields which have been completed have all gone over rather than under their estimated yields.

In the Vale territory the sugar company field man places an estimate for an average production of 12.5 to 13 tons, while many of the growers state their beets are making from 13 to 15 tons, with their best

beets still to be harvested. Chris Reitz, a tenant on the Walter Foster farm 5 miles east and 2 miles north of Vale, is making 15 tons at the present with the expectation that one field will go 20 tons an acre. Beets on the Semmons land just south of the Empire beet dump are going 20 tons, with the same story of better beets still to come.

The Nisland territory was estimated to average 12.3 tons, with Mr. Knapp now raising his estimate to 13.3 tons with the belief that he is still too low. Twelve acres on the Langdon farm, just north of Nisland, made 16.7 tons; 6.8 acres on the Grant Morseman farm, 3 miles east of

Nisland, made 17 tons per acre. C. I. Parks, one of the progressive farmers of the Arpan section, has cleaned up one field that made 16.5 tons an acre. Frank Stoughton, also in the Arpan section, in a field that was estimated at 15 tons, has cleaned up 3 acres of the poorest part of the field at the rate of 16 tons per acre.

In the Newell territory, the average production at the present time is 12.3 tons, with every reason to believe that this will be maintained if not bettered. Carl E. Anderson, a tenant on a State rural credit farm 2 miles south of Newell, has cleaned up 5 acres from one field that is averaging 14 tons and expects his final average to equal this figure. Harry Cunningham, from a field of fall-plowed alfalfa land just south of the project headquarters, is making a little better than 14 tons. Adam Flaumer, a tenant on the Kenaston farm 2 miles east and 6 miles south of Newell, is averaging 16 tons from a field that, had it been properly prepared for irrigation, would easily have made 20 tons an acre.

At the sugar factory on the 29th of September, 1,500 tons of beets were being sliced daily, with a sugar content of 15.4 per cent compared to last year's high of 15.7 per cent. The plant, owing to the installation of new filter presses, has been slow in working up to capacity. With the acreage under contract and the high average yields, the plant will be pushed to the limit in order to handle the season's production of beets in the period it will be able to run economically.



Dairy herd of a new settler on the Belle Fourche project, S. Dak.

Belle Fourche Project Attracts Dairy Farmers

Within the past few weeks, seven new families have secured locations on the Belle Fourche project in the vicinity of Newell. They were attracted to this section by the excellent opportunities for the man who plans on dairying as the major part of his farm operations. One of the newcomers has moved down from Harding County, 2 have come from the vicinity of Burke, S. Dak., 1 from Rapid City, 2 are coming this fall from the Baker-Ismay country of Montana, and the seventh from Dixon, Ill., where it was necessary this year to pasture his cows along the public roads.

In each case these men were attracted to the Belle Fourche project because they could produce all their dairy feeds on local irrigated farms. Corn, oats, and barley, all good dairy grain feeds, can be produced to advantage. Our unlimited supply of first-class alfalfa hay, priced under \$10 a ton instead of \$25, as in the case of the Illinois man and other dairy sections of the country, looked like a real bonanza. The idea of an irrigated pasture, either mixed grasses, sweet clover or native grasses, that will furnish their cows a good, long-season pasture instead of only during the spring and early summer months was especially appealing, as was also the supply of succulent feeds, either beets or beet pulp, to balance winter-feed requirements.

Although seven dairy farmers do not begin to fill the farms of the Belle Fourche project suited to this type of farming, they do represent the forerunners of those to come. Any section, such as the Belle Fourche project, that can produce from 40 to 60 bushels of corn per acre, 50 to 75 bushels of oats, 35 to 60 bushels of barley, 3 to 5 tons of alfalfa hay, an irrigated sweet-clover pasture that will carry two cows to an acre during the pasture or irrigation season, coupled with ideal weather conditions, good marketing facilities, and low-priced land, is destined to come into its own where the dairy farmer is concerned.

Ships First Car of Honey

Dr. O. H. Clark, of Newell, has the distinction of shipping the first carload of honey from the Belle Fourche project for the 1928 honey season. He also has the distinction of being the first producer of honey in the Newell territory to ship his product in car lot. In addition to this shipment, Doctor Clark has trucked out eight loads of honey, or slightly more than half a carload, and expects to move the

most of the remaining 1928 crop in this manner in supplying his established trade.

Doctor Clark's first car of honey was sold through Root & Co., and goes to a bottler of fancy honey at Kansas City, where it will be transferred from its present 60-pound containers to small glass jars holding 4, 8, and 16 ounces. The selling price on this shipment was 8½ cents per pound, less a commission charge of one-eighth cent a pound. It represents a part of a 65-ton crop of honey from 700 colonies of bees, 250 of which were package bees this spring.

Up-To-Date Hay Loader On Newlands Project

One of the progressive farmers on the Newlands project, Nev., is building hay derricks 60 feet high so that he can stack his hay in round stacks, 40 feet high and containing 250 tons each. No hand power is used in stacking the hay. The shocks are put up by machinery and with the loaders used 500 pounds of hay are picked up in one shock.



Owyhee dam site, Owyhee project, Oreg.-Idaho

Power Development, Yuma Project, Arizona-California

By L. N. McClellan, Electrical Engineer, Bureau of Reclamation

IN 1924 Congress appropriated \$250,000 for the construction of a hydroelectric power plant on the Yuma project in order to provide cheap power for project purposes. Contract was let for the construction of the power plant on December 5, 1925, and the plant was completed the following year and placed in regular operation on July 26, 1926.

The power plant is located at the siphon drop on the main canal about 10 miles below Laguna Dam and 3 miles north of the town of Yuma, Ariz., at which point there is a drop of 10 feet in the main canal. The canal has a capacity of about 1,800 second-feet which is available for generation of power except at times when the full amount can not be diverted at Laguna Dam owing to low stage of the Colorado River. Under the present head of 10 feet the output of the plant is 1,100 kilowatts. When the all-American canal is constructed the water surface in the canal above the siphon drop will be raised 4 feet and the head will then be 14 feet. The power plant was designed and constructed for the ultimate head of 14 feet at which head the output will be 1,600 kilowatts.

GENERATING EQUIPMENT

There are two generating units in the power plant, each of which consists of a vertical shaft, 1,000-kv-a., 3-phase, 60-cycle, 2,300-volt alternating current generator direct-connected to a high-speed, propeller-type hydraulic turbine which operates at a speed of $112\frac{1}{2}$ revolutions

per minute and which is rated at 1,160 horsepower at 14 feet head. Each generator is provided with a 30-kilowatt, 125-volt, exciter direct-connected to the upper end of the main generator shaft and each turbine has an oil-pressure type governor of 16-300-ft.-lb. capacity with motor-driven fly balls and motor-driven oil pump. The turbine pressure cases are of the semispiral type built of reinforced concrete, forming the substructure of the power house, and the draft tubes, which are also built of reinforced concrete, are of the conventional elbow type.

AUTOMATIC SWITCHING EQUIPMENT

The switching and control equipment is of the full automatic type with provision for manual operation if desired. Starting and stopping is accomplished by the operator pressing a push button located on each generator panel of the switchboard. When the start button is pressed the air brakes are first automatically released, the governor then slowly opens the turbine wicket gates and the unit gradually comes up to speed. Just before synchronous speed is reached the generator oil circuit breaker closes, connecting the generator to the station bus and immediately thereafter the field switch closes and the unit pulls into step with the line under control of its voltage regulator. When the stop button is pressed the generator oil circuit breaker and field switch both open, the governor closes the turbine wicket gates, and when

these are completely closed the air brakes are applied, bringing the unit quickly to a stop. The units are automatically shut down in case of low voltage on the transmission line, excessive current in the generator windings, overspeed, failure of pressure in the governor oil system, loss of excitation, failure of generator winding, or hot bearings on generator or turbine. The governors are each provided with a float control which automatically reduces the opening of the turbine wicket gates in case the elevation of the water surface in the fore bay drops below a predetermined point. The power output is adjusted by this means to suit the quantity of water available in the canal and loss of head is thereby prevented.

AUXILIARY EQUIPMENT

In addition to the main generating units and automatic switchboard, the power house contains the station service transformers, which supply power for lights and power about the plant; a 60-cell storage battery with $1\frac{1}{2}$ -kilowatt motor generator charging set, which furnishes power for the control apparatus; a small motor-driven air compressor; and a 30-ton traveling crane equipped with motor-driven hoist and hand-operated travel and water system, which supplies domestic water for the power plant and operator's cottage.

TRANSFORMER AND SWITCHING STATION

An outdoor type transformer and switching station is located adjacent to the north end of the power house, the equipment of which comprises a bank of transformers, consisting of three 667-kv-a., single-phase, outdoor, self-cooled, 2,300-volt to 19050/33,000 Y transformers, with a fourth transformer for spare; two 33,000-volt, station type, autovalve lighting arresters, one on each of the outgoing 33,000-volt lines; one 33,000-volt automatic outdoor oil circuit breaker and high-voltage meter equipment on the line connecting with the Southern Sierras Power Co.'s system; and a 33,000-volt air break switch on the line serving the Yuma project.

OPERATION OF POWER SYSTEM

The siphon drop power plant has been in continuous operation for a little over two years with the exception of the short periods when water was out of the main canal for repair purposes, and aside from



Siphon drop power plant, Yuma project, Ariz.-Calif., showing suspension bridge used for gaging

some minor troubles which were experienced at first and which were later remedied, the operation has been very satisfactory. Power is transmitted over a 33,000-volt transmission line $29\frac{3}{4}$ miles in length to a substation at headquarters which supplies lights and power for the office, shops, etc., at this point, to the B lift pumping plant which supplies water for irrigation of lands on the Yuma Mesa and to the boundary pumping plant which pumps drainage water, developed in the various drains on the valley division of the Yuma project, over the levee into the Colorado River. A second 33,000-volt circuit about 3 miles in length mounted on the same poles which support the first

circuit connects the siphon drop power plant with the Southern Sierras Power Co.'s substation at Yuma.

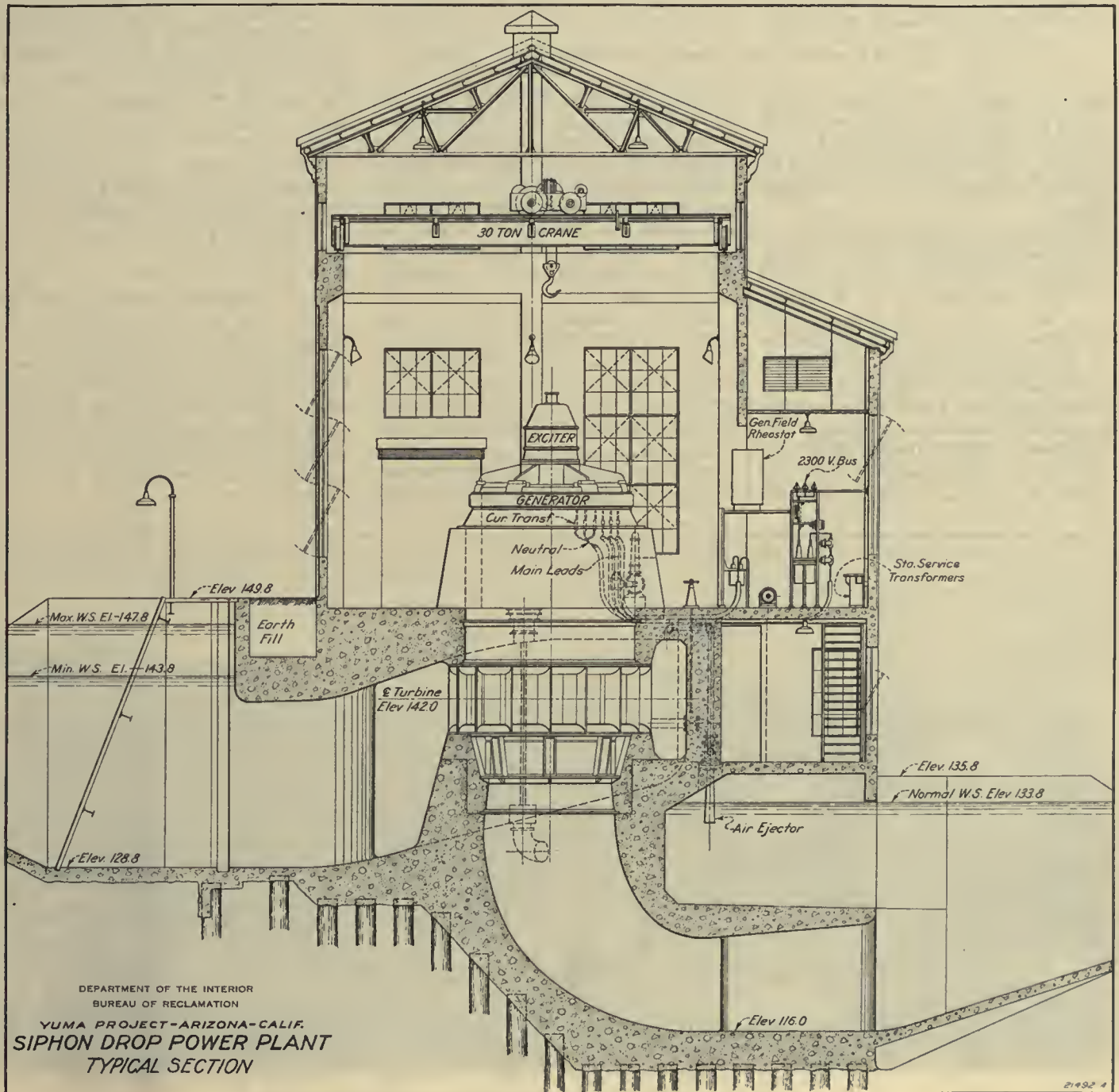
Before the siphon drop power plant was constructed, Yuma was on the end of a long single-circuit transmission line which brought power across the State of California from power plants at San Bernardino and Bishop Creek and frequently trouble on this long line would cause interruptions to service at Yuma. This situation has been greatly improved by the siphon drop power plant as in case of trouble on the transmission line it can be disconnected and the more important part of the Yuma load can be served direct from the siphon drop power plant until

such time as the transmission line is repaired and restored to service.

FINANCIAL RESULTS

The tabulation on page 172 shows the results of the operation of the power system for the period August 1, 1926, to August 1, 1928.

The financial success of the Yuma project power system is due in large measure to the favorable contract under which surplus power is sold to the Southern Sierras Power Co. Under the provisions of this contract the company agrees to take all the surplus power available night and day and this results in the siphon drop power plant operating on a very



Energy delivered:	
Used on project exclusive of Yuma auxiliary project kilowatt-hours	1, 685, 881
Used by Yuma auxiliary project	1, 107, 900
Sold to Southern Sierras Power Co.	7, 927, 603
Miscellaneous sales	17, 883
Total energy delivered	10, 739, 267
Revenue:	
Energy used by project	\$18, 680. 57
Energy used by Yuma auxiliary project	11, 937. 04
Surplus energy sold to Southern Sierras Power Co.	71, 512. 98
Miscellaneous revenue	2, 356. 29
Total gross revenue	\$104, 486. 88
Cost of production:	
Operation and maintenance	28, 462. 27
Purchased power	5, 868. 13
Depreciation	26, 681. 29
Total cost of production, including depreciation	61, 011. 69
Net profit	43, 475. 19
Saving in cost of power used on project and Yuma auxiliary over cost of power purchased at commercial rates	47, 383. 00
Total benefit resulting from two years' operation of power system	90, 858. 19

high load factor. The company pays 1 cent per kilowatt-hour for all energy received during the hours from 8 a. m. to 8 p. m. and three-quarters of a cent for all energy received during the remaining hours.

Net earnings of the power system are credited annually to the lands to which supplemental construction on account of the siphon drop power plant is charged and a distribution of 10 cents per acre was applied to the supplemental construction charge due December 1, 1927, and a further distribution of 25 cents per acre has been approved which will be applied on the 1928 construction charges due December 1, 1928. During these two years, part of the power revenues was applied on the repayment of funds ad-

vanced by the Southern Sierras Power Co. for construction of the interconnection between the siphon drop plant and the company's system and part was applied on the unsecured portion of the construction cost of the power plant and this has reduced the amount available for distribution. In the future the distribution of net revenues should amount to about 70 cents per acre.

The Yuma auxiliary lands do not participate in the distribution of net power revenues as these lands were not charged with any portion of the construction cost of the power plant, but they benefit from the power development owing to the reduction in cost of power for operation of the B lift pumping plant. Up until the time that power became available from the

Government plant the cost of power used at the B lift pumping plant was about \$0.0286 per kilowatt-hour, whereas power from the Government plant is now furnished to the B lift plant at \$0.0082 per kilowatt-hour. It is estimated that the siphon drop power plant has saved the Yuma auxiliary lands about \$19,000 during the past two years in the cost of power and this saving will of course increase as the power requirements of the Yuma auxiliary project increase.

Federal Reclamation Laws Annotated

A supplement to the 1927 edition of Federal Reclamation Laws Annotated has been compiled recently by Miss Glenna F. Sinclair, of the Washington office, under the direction of Assistant Commissioner Dent. A limited supply of the supplement is available and copies may be obtained on request. In this connection the following is quoted from a recent letter from one of our district counsel:

"I was very glad to receive the supplement and to learn that it is planned to issue similar supplements in the future. Federal Reclamation Laws Annotated has proven to be one of the most useful volumes I have ever had occasion to use. As well as serving as a convenient desk book, I find that it is a most valuable book to take to court and to hearings which are often held at places where volumes of compiled or revised statutes are not available. The annotations are very helpful."



Diversified agriculture, including alfalfa, almonds, and milo on the Orland project, Calif.

Legal Notes of Interest to the Reclamation Projects

Standard Government Construction Contract, Liquidated Damages, Extension of Time, Advertising, Acceptance of Other Than Lowest Bids, Time as an Element

TWO recent decisions of the Comptroller General are of general interest to the officers of the Bureau of Reclamation.

The first is the decision of July 13, 1928, designated A-23639, on the subject of "Standard Government construction contract—liquidated damages—extension of time," and appears on page 13 of volume 8, July, 1928. In this decision the Comptroller General holds that under the standard Government construction contract the practice of granting extensions of time is obsolete and that administrative officers are without authority to grant such extensions, the authority of such officers being limited to either canceling the contract because of the default of the contractor or permitting the contractor to perform and stating the facts of delay. The Comptroller General declines to make an advance decision as to whether liquidated damages would be deducted under the conditions stated in the question submitted to him for decision in this case. The decision in full is as follows:

Comptroller General McCarl to the Secretary of the Interior, July 13, 1928:

There has been received your endorsement of July 10, 1928, forwarding the request of the Fairchild Aerial Camera Corporation for an extension of time under its Standard Government Construction Contract No. I, section 19, dated April 6, 1928, and requesting decision whether "under the circumstances cited, the department can extend the time desired."

The contract in question is for furnishing 1 complete instrument capable of producing topographic maps from aerial photographs and combining in one apparatus the visual measuring and drafting systems necessary in producing the maps, together with 1 pair of plate holders, 1 aerial mapping camera, 10 plate magazines, and 1 magazine for films.

It is reported that subsequent to the execution of the contract there had been developments of a highly technical character relating to the optical setting of lenses and the arrangement of plate holders, which developments had been obtained from various sources in this country as well as abroad, through practical uses of the apparatus known as aerocartograph, and that while the original plate holders would satisfactorily perform their functions they could be improved and reflect a saving in time, with a greater degree of accuracy in producing maps by improvements made therein through the utilization of the latest available information. Apparently the Fairchild Aerial Camera Corporation made arrangement with the Aerotopograph Co., of Dresden, Germany, to manufacture plate holders, and that company had requested three months' additional time after July 1, 1928, date fixed for completion of the contract, within

which to complete delivery of the plate holders. The contractor has agreed to incorporate improvements in the plate holders without additional expense to the Government, and the procuring agency has expressed its desire to permit the improvements to be made.

Article 9 of the Standard Government Construction Contract is quoted in 6 Comp. Gen. 650 and need not be quoted herein. In substance said article provides for the cancellation of a contract in event of default of a contractor or for permitting the contractor to continue until performance has been completed, with a charge for liquidated damages on account of all delays not due to certain specified causes. As stated in 6 Comp. Gen. 650 and 7 id. 534, there is no authority in administrative officers under article 9 of the Standard Government Construction Contract to grant extensions of time within which to complete delivery. The administrative authority is limited to either canceling the contract for default in delivery or permitting the contractor to continue until performance has been completed and reporting the facts of the delay to this office for consideration as to whether liquidated damages should or should not be charged under the contract.

Article 16 (d) of the contract in this case provides that:

Upon completion and acceptance of all work required hereunder, the amount due the contractor under this contract will be paid upon the presentation of a properly executed and duly certified voucher therefor, after the contractor shall have furnished the Government with a release, if required, of all claims against the Government arising under and by virtue of this contract, other than such claims, if any, as may be specifically excepted by the contractor from the operation of the release in stated amounts to be set forth therein; payable from appropriation for topographic surveys, 1929.

When the contract has been completed, the voucher for the contract price with report of all the facts in the matter of the delay, with administrative recommendation as to whether or not liquidated damages should be charged for all or any part of the delay, should be submitted to this office for settlement. If the contractor should so request, it may be paid the contract price less liquidated damages for any delay in delivery, and a separate voucher for the amount withheld as liquidated damages, accompanied by administrative report and recommendation, may be submitted to this office for settlement.

Answering your question specifically, you are advised that you are not authorized to grant any extensions of time under article 9 of Standard Government Construction Contract, and this without reference to the question whether or not the facts of delay are such as to preclude charging the contractor with liquidated damages. In other words, the procedure heretofore of administrative officers granting extensions of time for delay in completion is obsolete under the Standard

Government Construction Contract. There has been substituted therefor the administrative function of reporting on the facts of delay where the contractor has been permitted to continue until performance has been completed.

The second is the Comptroller General's decision of July 31, 1928 (A-23703), upon the subject "Advertising—bids—acceptance of other than lowest—time as an element" reported in Decisions of the Comptroller General, volume 8, July, 1928, page 52. By this decision, the Comptroller General holds that where time of delivery is an important element, that fact should be clearly stated in the original or printed specifications, invitations for bids, or instructions to bidders and there is no authority for acceptance of other than the lowest bid where the bidders were only advised orally that time of delivery was an important element and the higher bidder offered to make delivery at a much earlier date than did the low bidder. This decision in full is as follows:

Comptroller General McCarl to the Secretary of War, July 31, 1928:

Your attention is invited to contract No. W-190-qm-51, dated April 11, 1928, with R. D. Wood & Co., covering the purchase of cast-iron pipe, fittings, and valves for the War Department, constructing quartermaster, Carlisle Barracks, Pa., it appearing that award of the contract was made to other than the lowest bidder.

The reasons for acceptance of other than the lowest bid are set forth on the abstract of bids as follows:

Award made to bidder as shown. Low bid not accepted, as delivery could not be completed in desired time; also pipe was not the kind as called for on specifications.

It appears that the low bidder proposed to deliver within 60 days, whereas the accepted bidder agreed to deliver within 21 days.

An examination of the specifications and invitation for bids discloses nothing to indicate a maximum time limit within which delivery had to be made, or that the time required for delivery would be considered in awarding the contract. Under such circumstances there was no authority for rejecting any bid merely because the time in which delivery was proposed was greater than the time specified in some other bid. In this connection attention is invited to decision of January 28, 1926, 5 Comp. Gen. 546, 548, in which it was said:

If time is to be a controlling element in the acceptance or rejection of a particular bid, it should be so stated in order that all bidders may have equal opportunity to offer supplies, etc., within the time so stated. In the matter here presented, the instructions to bidders stated that time of proposed delivery would be taken into account in making the award. Therefore,

If it can be shown that the difference in time of delivery is of more value to the Government than the difference in price, acceptance of the higher bid is authorized, otherwise the award should be made to the lowest bidder. In determining the value to the Government of the difference in time of delivery there would be for consideration the rate of liquidated damages to be stipulated in the contract for delay in delivery.

In the present case it is stated that each of the bidders was advised orally that time of delivery was an important element. The practice of giving instructions, explanations, or information to bidders orally instead of in the written or printed specifications, invitations for bids, or instructions to bidders is objectionable and should be discontinued.

The award of the contract in this case will not be further questioned, but the matter is brought to your attention for such administrative action as may be necessary to prevent the recurrence of such a transaction.—*B. E. Stoutemyer, District Counsel.*

Regulations for Taking Crop and Livestock Census

On Federal Reclamation Projects for Year Ending December 31, 1928

THE crop and livestock census for the year 1928 on Federal reclamation projects shall be taken by employees of the bureau under the direction and supervision of the project superintendent, except on projects which have been turned over to the water users, when the census shall be taken by employees of the water users' association or irrigation district under the supervision of an employee of the Bureau of Reclamation designated by the commissioner. If no such supervisor of the census is designated by the commissioner, then the manager or superintendent of the district or association shall act as supervisor of the census. The methods employed will be similar to those followed in 1927.

CENSUS FORMS

The record forms to be used by the enumerator will be the usual Bureau of Reclamation Form 7-332, as modified in 1925. The Washington office of the Bureau of Reclamation has a supply of these forms on hand, and the various projects should request the number required for this year. Surplus forms on hand from the 1927 supply may be used this year, and this should be taken into account when requesting forms. The form enumerates most varieties of crops produced and stock kept on the various projects. Blanks are provided on the form for listing additional items. Automobiles, trucks, and tractors should be listed and valued separately from other farm equipment, which should be valued as a lump sum.

ACCURACY OF RECORDS

The Bureau of Reclamation has found the crop and stock census data taken annually in past years to have great value for reference. Under section 4 of the act of December 5, 1924 (43 Stat. 672, 701), which provides for repayment of construction costs on the basis of the average gross annual acre income, these census data become of paramount importance and should be collected with

great care. The enumerators should interview the farmer and secure his cooperation if possible. Absentee owners and other conditions will necessitate the use of good judgment based on the best information obtainable. Form 7-332 should be dated and signed by the owner where possible, otherwise by the enumerator.

SUPERVISOR

The project superintendent shall be the supervisor of the census on projects being operated by the United States. On projects being operated by the water users, an employee of the Bureau of Reclamation appointed for that purpose or the manager or superintendent of the water users' association or irrigation district shall be the supervisor of the census. The project superintendent, or employee of the Bureau of Reclamation designated as supervisor of the census or the manager or superintendent of the water users' association or irrigation district, as the case may be, shall appoint the enumerators and review their work. He shall confer with leading produce and commission men and water users of the project and determine the values to be applied to the various crops. He shall have prepared, under his direction, the necessary summaries of all data collected and transmit the original copy to the Washington office of the Bureau of Reclamation and a duplicate copy to the Denver office of the Bureau of Reclamation. Before the census shall be of any effect on those projects which have been turned over to the water users it is necessary that the Secretary of the Interior approve these summaries.

INFORMATION SHOWN

The crop census shall show, with respect to each farm, the total number of irrigable and irrigated acres, the number of acres of the various crops grown, the yields per acre, and the values of such crops. Supplemental data showing whether the crops were sold, fed, or stored should be shown.

HOW TO VALUE

Many farmers will not have sold their crops; then the enumerator shall place a value upon such crops in accordance with the unit prices as fixed in general by the supervisor; others will have fed hay and grain to livestock, and the value of such crops shall be determined as if the crops had been sold. Hay, fodder, or other harvested forage shall be valued in the stack on the farm. Crops such as grain, beans, potatoes, seeds, etc., shall be valued f. o. b. cars, shipping point, exclusive of the cost of containers. Fruits, berries, and vegetables shall be valued f. o. b. cars, shipping point or warehouse, exclusive of the cost of grading, packing, storing, and containers. All factory crops such as sugar beet, string beans, cucumbers, tomatoes, etc., shall be valued at the selling price to factories or dealers (including estimated bonuses) f. o. b. shipping point, when not delivered direct to the factory. Grain crops which were not harvested for hay or grain should be included as pasture. A distinction should be made in value between tame and wild irrigated pasture and the value should be a reasonable annual rental for such pasture. Straw, sugar-beet tops, hay and grain stubble, etc., and other by-products should be listed and valued. All gardens and miscellaneous crops should be listed and valued.

THE cucumber harvest on the Belle Fourche project ended with the heavy freeze of September 25, returns from 1-acre patches running from \$100 to \$200. The highest return was reported from the George Seitz farm near Vale where 3½ acres gave returns of \$684.

THE North Morrow County Agricultural Fair was held recently at Irrigon on the west extension of the Umatilla project. Among the exhibits of project products were three watermelons weighing a total of 148 pounds.

"Success on Irrigation Projects"

A BOOK by Dr. John A. Widsöe, educator, author, and churchman, commands the respect and attention of the reading public. His latest work, *Success on Irrigation Projects*, published by John Wiley & Sons, New York, is no exception. Drawing on a fund of experience covering many years of intimate study of irrigation problems, as director of the Utah Experiment Station, president of the Agricultural College of Utah, and secretary of the special advisers on reclamation, Doctor Widsöe presents in this book an excellent example of clear and constructive thought.

As pointed out in the preface, the book sets forth, "for nontechnical readers, the main principles, by the use of which the irrigated and irrigable area may be made to serve more completely the needs of modern, civilized man." In his development of this theme Doctor Widsöe has drawn freely on the report of the special advisers on reclamation, appointed in 1923 by Hon. Hubert Work, former Secretary of the Interior.

The 11 chapters in the 153-page book discuss irrigation in the United States, locating irrigation projects, the people on the projects, helping the farmer, the use of irrigation water, irrigated agriculture, paying for the farm, factors of colonization, problems of existing projects, civilization under the irrigation ditch, and the destiny of the arid and semiarid area.

The main factors involved in the location of irrigation projects are listed by Doctor Widsöe as engineering feasibility, water supply, land productivity, economic environment, social acceptability, and acre cost, all tied together by the law of development from settled to open sections.

Six equally important factors to smooth the path of colonization are stated as follows:

1. That the project to be colonized, when industriously and intelligently tilled, must return an income sufficient to enable the farmer to pay his obligations and to live a life worthy of our high civilization.

2. That men placed on the farm must be fitted by temperament and health for work in the open country.

3. That the farmer must be provided, as needed, with the necessary technical and financial aid, and the proper leadership must be found to guide him.

4. That the settlers should be organized into communities for their economic, social, and religious welfare.

5. That the water users must be allowed to govern the projects in the distribution of water and the maintenance of the works.

6. That the religious impulse is necessary to achieve high and lasting success on a colonization venture.

Several of the fundamental principles of success referred to by Doctor Widsöe have already been put into practice on the Federal reclamation projects either as a result of remedial legislation or through administrative action.

The law now provides that settlers shall be selected on the basis of approved qualifications of industry, experience, character, and capital. The capital of a settler must be at least \$2,000 or its equivalent in livestock, farming implements, or other assets of equal value deemed by the examining board on a project to be as useful to the settler as cash. He must also have had at least two years' farming experience, preferably on irrigated land.

The suggestion by Doctor Widsöe that "the United States, in its future reclamation work, must provide that privately owned land reclaimed by Government projects shall be sold at fair prices" has been met by the administrative requirement that contracts shall be entered into with the irrigation districts on the new projects providing for the appraisal of unimproved land in private ownership on the basis of its present state without reference to pro-

posed construction. All areas in excess of 160 acres must be sold to settlers at not more than the appraised value. Lands owned in areas of less than 160 acres may be sold for more than their appraised value upon the condition that 50 per cent of the selling price in excess of the appraised value shall be turned over to the irrigation district to be applied as a credit to the water right on that particular tract of land.

The operation and maintenance of the projects are being turned over to the water users' organizations as fast as practicable. During the past two years 18 irrigation districts under 10 projects have been turned over to local control.

The feasibility of proposed projects is now determined in advance of construction by the most careful economic surveys, and no project is approved for construction which can not meet these tests.

A basic need, referred to by Doctor Widsöe, is financial aid in the early years of changing raw land to a producing farm. Most settlers come to the projects with entirely inadequate capital, which must be supplemented from some source if reclamation is to be completely successful. This need has been recognized by many foreign nations in their work of colonization. Its adoption as a settled policy in the United States can not be long delayed.

Doctor Widsöe's vision and optimism are reflected in his belief that "a great era of reclamation and colonization awaits our country. An increasing population and changing economic needs and social ideals will make new demands upon our vacant lands from shore to shore." To those who share in this belief the book is an inspiration and a challenge.—H. A. B.



A well-kept farm home on the Orland project, Calif.

North Platte Project Fair Prize Winner

The accompanying photograph shows the Scotts Bluff County exhibit at the recent Nebraska State Fair. For the purpose of judging the county exhibits at the fair the State is divided into three sections. The exhibit of Scotts Bluff County was given first prize in the western division. All of the irrigated sections of Nebraska are included in this division. Although no prize was offered for the best county exhibit in the entire State, it is reported that the Scotts Bluff County exhibit would compare very favorably with any other exhibit. The exhibit was awarded 148 points out of a possible 150 offered on taste shown in the arrangement of the exhibits. In addition to the prize for the exhibit as a whole individual entries received 163 prizes, of which 35 were first, 30 second, 37 third, 40 fourth, and 21 fifth.

The exhibit was collected and arranged by Mr. Winfield Evans, of Scotts Bluff, Nebr., who has had charge of the exhibit in previous years, and a large part of the exhibit was grown by Mr. Evans. In addition to the advertising value of the exhibit itself, several thousand pieces of advertising matter describing the North Platte Valley were distributed. Some idea of the advertising value of the

exhibit may be gained from the fact that the Nebraska State Fair now ranks first in the United States per capita attendance, daily average attendance, and annual gain in attendance during the last five years. The total attendance this year was 427,134.

Arrowrock Dam Topped By 362-foot Swiss Dam

The Schraeh Dam in Switzerland, which was built in 1924-25, has a maximum height of 362 feet, or 13 feet higher than the Arrowrock Dam on the Boise project, Idaho. The Schraeh Dam has a crest length of 550 feet and a volume of 305,000 cubic yards. It provides storage capacity of 105,000 acre-feet in connection with the Waeggital power development near Zurich.

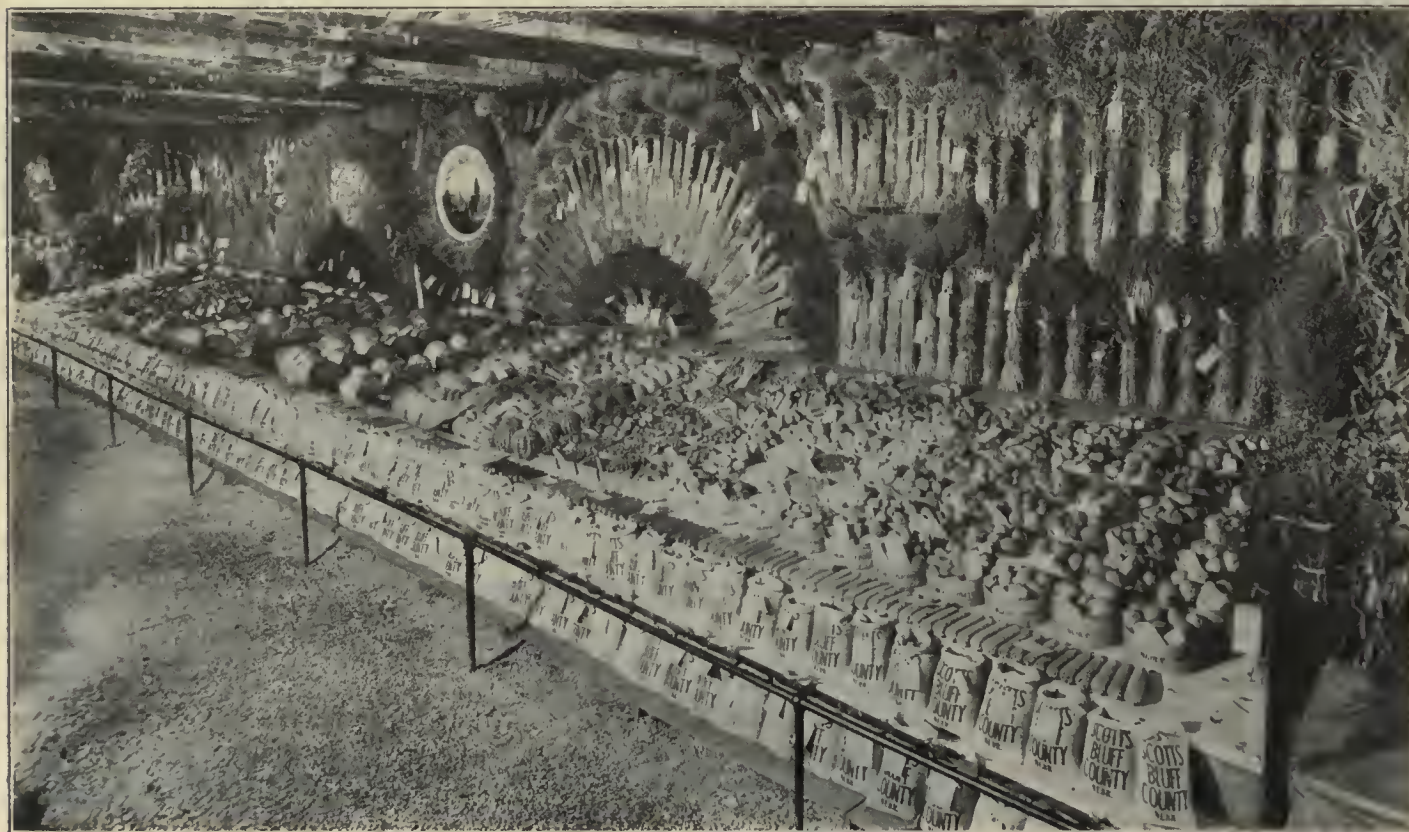
An interesting feature in connection with this dam is that the lower or inner stream gorge follows a fault plane, the weakened rock along the contact plane of which had been eroded by the stream to a depth of some 80 to 100 feet below the upper glacially eroded portion of the gorge. Although the fault has a vertical throw of 130 feet, the material along the contact plane in the bottom of the gorge proved sound and tight.

Tule Lake Bird Refuge. Created in California

By Executive order, President Coolidge has created the Tule Lake bird refuge in northern California. The new refuge consists of 10,300 acres of Government lands in northeastern Siskiyou County, Calif., within the Klamath irrigation project. These lands are flooded to a considerable extent by waste water and thus form an excellent waterfowl resort.

This refuge, which lies just south of the California-Oregon line, will supplement the Clear Lake refuge in California, just east of Tule Lake, and the recently established Upper Klamath refuge, on the west shore of Klamath Lake, in Oregon. A year ago it was announced that because of lack of water a reflooding program on Lower Klamath Lake, west of Tule Lake, would have to be abandoned. The establishment of the refuge, therefore, on Tule Lake will in a measure offset the loss of possible sanctuary caused by the abandonment of the Lower Klamath program.

Tule Lake has long been the mecca for such wild fowl as the mallard, redhead, ruddy duck, cinnamon teal, avocets, stilts, and other shore birds. It also is a favorite wintering ground for the cackling goose, a bird that breeds on the north-west coast of Alaska.



Agricultural exhibit of Scotts Bluff County at Nebraska State Fair, 1923

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George C. Kreutzer, Director of Reclamation Economics

W. F. Kubach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Debler, Hydrographic Engineer;
L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent;
C. A. Lyman and J. E. Overlade, Fiscal Inspectors.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Youngblutt.....	J. P. Siebeneicher.....		Wm. J. Burke.....	Mitchell, Nebr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....		B. E. Stoutemyer.....	Portland, Oreg.
Carlsbad.....	Carlsbad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	C. E. Brodie.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....				
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....				
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chabot.....	E. E. Chabot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....		Miss E. M. Simmonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nebr.....	H. C. Stetson.....	Virgil E. Hubbell.....	Virgil E. Hubbell.....	Wm. J. Burke.....	Mitchell, Nebr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....		N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	O. H. Lillingston.....	O. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nebr.
Salt River ⁷	Phoenix, Ariz.....	C. C. Cragin.....				
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....		E. E. Roddis.....	Billings, Mont.
S. Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....				
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Oreg.....	A. C. Houghton.....				
Uncompahgre.....	Hermiston, Oreg.....	Enos D. Martin.....				
Valo.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Phlebaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....		B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹⁴	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.
Orland, Stony Gorge Dam.....	Stony Gorge Dam site, Elk Creek, Calif.....	H. J. Gault ¹⁵	C. B. Funk.....		R. J. Coffey.....	Berkeley, Calif.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperativa agency
Middle Rio Grande.....	Denver, Colo.....		Middle Rio Grande conservancy district.
Heart Mountain Investigations.....	Powell, Wyo.....	I. B. Hosig.....	
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	



HONEY EXHIBIT AT THE CASSIA COUNTY FAIR, SEPTEMBER, 1928, BY H. H. KECK, OF PAUL, IDAHO, A WATER USER ON THE MINIDOKA IRRIGATION PROJECT

NEW RECLAMATION ERA

VOL. 19

DECEMBER, 1928

NO. 12



STORED WATERS, BORN OF SNOW-CLAD PEAKS, MAKE FRUITFUL VALLEYS OUT OF ARID WASTES

REDUCE PRODUCTION COSTS

“ONE of the most effective means of reducing production costs is to increase the yield of product. To the achievement of such efficiency the farmer of the future will strive through spending more time in the selection of seed, the improvement of his livestock, the growing only of such crops and livestock as are best adapted to the conditions of soil, climate, and other natural conditions of his farm, through scientific crop rotation, fertilization, properly planned drainage, treatment of seed for disease, the feeding of balanced rations to livestock, the use of sanitary methods in the production of livestock, and the use of lime and legumes and other economical methods of fertility maintenance. The use of machinery to cut costs, especially of labor, will receive increasing attention by thoughtful farmers. Means of reducing costs lie within reach of most farmers and the more far-sighted have already begun to take advantage of them.”

NEW RECLAMATION ERA

Issued monthly by the Bureau of Reclamation, Department of the Interior, Washington, D. C.

Price, 75 cents a year

ROY O. WEST
Secretary of the Interior

ELWOOD MEAD
Commissioner, Bureau of Reclamation

Vol. 19

December, 1928

No. 12

Interesting High Lights on the Federal Reclamation Projects

STONY Gorge Dam, Orland project, was completed on October 25, and the event was celebrated by 3,000 people at Orland on October 27. Views of the new dam appear on the back cover page of this issue.

THE contract with the Okanogan irrigation district for turning over to the water users the operation of the Okanogan project and adjusting the building charge was presented to the vote of the water users on October 2. The vote was 115 in favor of the contract and 2 against.

OPTIONS have been renewed on 59 farms in private ownership on the Orland project for sale, after an independent appraisal, to settlers on amortized payments over a period of 20 years. These farms comprise 1,637.8 acres and are valued at \$214,925.

AT a recent sale of lots in the town sites on the Huntley project 190 were sold on the day of sale and 20 since that time. The total value of the lots was \$3,382, of which \$1,142 was paid in cash, the balance to be paid in annual instalments.

PAPER shell pecan growers on the Yuma project have inaugurated an annual "pecan day" to be observed locally by all interested in the development of this industry. This year's celebration was attended by eminent authorities who gave a number of talks on the growing of pecans as a commercial crop.

THE Pomona Grange Fair held recently at Boise and the Dairy Show at Caldwell, Boise project, were fine exhibitions and attracted large crowds. Both exhibitions were sponsored by farmers' organizations.

A MILWAUKEE corporation has entered into a conditional contract for 200 acres of artichokes in the Umatilla project, Oregon. In addition, conditional contracts have been made with farmers of the district to grow the new crop. Artichokes grown in the Hermiston district have been sent to Milwaukee to be tested, and if the sugar content is found satisfactory the conditional contracts will be made permanent.

CONSTRUCTION of a main building 50 by 140 feet in size for a veneer and box factory at Montrose, Uncompahgre project, has been practically completed. The plant will operate the year round making veneer and box wood for all kinds of fruit and vegetable boxes, as well as egg crates, giving steady employment to 25 or 30 men.

THE Yuma Mesa Fruit Growers' Association have completed their organization and adopted trade names for marketing their product, namely, "Yuma Mesa" for first class fruit and "Desert Chief" for seconds. The association will pick the fruit and ship it to Arlington Heights, Calif., where it will be packed and marketed under the local association's trade names. During the month 612 boxes of grapefruit were picked from the Mesa orchards.

A LIVESTOCK train handled by the Great Northern Railway and supervised by the Montana State Extension Service visited the various towns on the Milk River project recently. This practical demonstration was conducted in the interest of better livestock, especially on the small irrigated farm. The improvement of stock resulting from proper breeding, care, and feeding was shown clearly in a practical manner. The exhibit is expected to encourage better methods of handling livestock on the project farms.

A SPECIAL train of prize-winning livestock was run over the Northern Pacific Railway recently en route to the Portland Livestock Exhibition, and arrangements were made for a 4-hour stop at Glendive, Lower Yellowstone project, where they were inspected by a large number of project farmers.

THE North Platte Valley Cooperative Poultry Marketing Association called recently for bids on three or four carloads of turkeys for the holiday trade. It is estimated that approximately 15 carloads of these birds will be marketed from the valley this fall.

TO celebrate the completion of the construction of the cut-off constructed by the Union Pacific Railroad to connect the North Platte Valley with Cheyenne and Denver, the railroad recently ran a special train in two sections, each pulled by two giant locomotives over the new road to Gering, North Platte project, where a large banquet was held.

NEWLANDS project exhibitors at the sixth annual potato and apple show on homecoming day at the University of Nevada in Reno brought home 24 prizes.

THE Truckee-Carson irrigation district, Newlands project, will soon have a majority of the farms on the project served with electricity. They have expended about \$122,000 in building power lines to farms. Benefits for this improvement have been assessed against the lands and payments when due will be collected on the common tax roll.

THE Southern Pacific Railroad has let the contract for the construction of the remaining portion of the Modoc Northern Railroad through the Klamath project. It is expected that the road will be completed about June, 1929.

Settlement and Farm Development Problems of the Vale and Owyhee Projects, Oregon

Paper read at the Oregon Reclamation Congress, Salem, Oreg., November 14-16, 1928

By George C. Kreutzer, Director of Reclamation Economics, Bureau of Reclamation

THE Vale and Owyhee projects in eastern Oregon and western Idaho were approved for construction by act of Congress dated December 5, 1924. The construction work is now in progress. The estimated cost of providing the irrigation and drainage works for both projects is \$22,500,000 which is to be repaid under the reclamation law in 40 years. These projects include some of the largest and most costly works yet undertaken by the Government. The Owyhee Dam will be the highest on record when completed. It will tower 405 feet above the foundation rock which is 56 feet higher than the Arrowrock Dam in Idaho. The Owyhee Dam will contain 525,000 cubic yards of concrete and when finished will cost about \$5,400,000. This dam will raise the water 312 feet and will create a reservoir of 1,120,000 acre-feet capacity of which 715,000 acre-feet will be above the outlet and available for the irrigation of project lands. Numerous tunnels, syphons, and flumes will be required to conduct the water through the main canals to the land to be irrigated.

These projects include a combined irrigable area of about 148,000 acres. Of this, 25,000 acres are in the Vale project. It is mainly raw land covered with black sage. The Owyhee project includes 123,000 acres and of this 70,000 acres are new lands which have never been cultivated.

The construction of the Vale project was urged because the land of the Warm Springs district had become seeped. Many settlers had moved away and others were being ruined by the spread of alkali and a rise in the water table. No private agency could be found that would finance drainage. Furthermore the district had built a reservoir and could use only half of its capacity. The Government purchased half interest in this reservoir and largely paid for the water by providing the needed drainage. The drainage is proving effective. Thus the construction of the Vale project tends to rescue the investment of several hundred settlers on the Warm Springs district and furnishes water for 25,000 acres of new land.

The Owyhee project was urged to furnish gravity water at reasonable cost to 41,000 acres now settled but supplied with water by pumping at excessive cost. The annual cost of water in some of these districts under pumps is \$11 an acre.

There will be no financial problem on the land on this project which is now settled and upon which a splendid agriculture is developed. All this area needs is cheaper water. The solvency of both projects will depend on what is done to stimulate settlement and farm development on the 70,000 acres of new land on Owyhee and the 25,000 acres on the Vale project. It will aid you in understanding the settlement and economic problems presented by Vale and Owyhee if what is being done to provide good irrigation systems and to solve some of the problems is briefly referred to.

ECONOMIC INVESTIGATIONS

Project lands were soil surveyed and classified before construction work was begun. The poor soils and lands of rough topography are eliminated. Careful hydrographic studies were made to assure that the water supply will be ample to grow high-priced crops. The canals and structures are being designed and constructed with the best engineering skill. Laterals will be provided so that every farm will be supplied with water. These systems will be substantial and permanent. Every precaution is being taken that water may be stored at periods of run-off, conserved until needed and then delivered to farms in sufficient quantities and at the proper times to promote maximum plant growth. Drainage, usually a tardy companion to irrigation, is provided for. On these projects it will not be necessary to wait until seepage has driven many settlers from their homes and is a menace to those remaining before actual drains can be built. The contracts with the districts provide that these drains shall be constructed when needed. The cost is included as part of the cost of the project. In other words, everything is being done to make these physical works modern and permanent and efficient for operating.

The soils of the Snake River Valley are renowned for their fertility and for their production of a wide variety of crops under irrigation. When good farming methods are followed, the yields of alfalfa, grains, vegetables, and fruits are exceptionally high. The yields of corn rival those of the best sections of the middle western Corn Belt. To secure these high returns, farms must be small and intensively cultivated.

These favoring conditions of soil and climate when joined with an adequate water supply carried through a substantially constructed irrigation system provide the foundation for a prosperous irrigation community. However, over 20 years of reclamation experience has shown that more is needed for a project to reach economic independence. Good soil and abundant water have not made other projects succeed. It often took years to settle the land with good farmers and for these to develop a profitable agriculture. Settlement, farm development, credit, and markets were allowed to work out themselves. There was no coordinated action bringing together the aid and leadership of all interested agencies to solve these problems. We are challenged to organize and invoke this aid in solving the problems of these projects. This was contemplated in 1924 when the projects were under investigation.

RECOMMENDATIONS OF ECONOMIC BOARDS

Two economic boards were appointed in 1924 to consider the economic phases of Owyhee and Vale. These boards were each composed of trained men from Oregon and Idaho who understood local conditions. They were joined by agriculturists of the Department of Agriculture and men who had long experience in the Bureau of Reclamation with these problems. These groups made land classifications, determined the size of farms, and worked out a program of agriculture adapted to climate and soil. They investigated the cost of clearing, leveling, and the cost of preparing land for irrigation. Estimates were made of the cost of buildings, fences, livestock, and farm equipment for minimum requirements. Estimates were also made of operating expenses and farm income. They charted a course for the economic development of the projects. The groups working independently arrived at practically the same conclusions. These conclusions in part regarding the Vale project follow:

Climate, soil, market, and transportation conditions warrant for this section a high type of agriculture.

Stock raising with dairy cattle as a basis, and hogs, poultry, and sheep to supplement, will form a basis for one of the major activities. The feeding of

beef cattle on meadow lands will continue to be an industry. Conditions are favorable for growing fruits and berries for home use.

The cash-crop farmer will find a lucrative field in the growing of clover seed, alfalfa seed, hay, corn, potatoes, lettuce, beans, cereals, and other staple crops.

The size of units should vary from 20 to 80 acres for intensive farming, and not to exceed 160 acres for the limited area of meadow land suitable for cattle feeding only.

The development of this area will require approximately 500 settlers.

The preparation of land for irrigation, including farm ditches, will vary from \$10 to \$30 per acre.

A 40-acre dairy unit, fully developed and equipped, will cost about \$7,500 from sagebrush to fully developed farm.

A good settler with \$5,000 capital and a loan of \$2,000 from the land bank during the second year will have solvent undertaking.

A settler with \$2,500 capital will have great difficulty without assistance other than is now provided.

A settler with \$2,500 taking a farm all cleared and one-half planted to perennial legumes can succeed with the aid of the land bank.

Their recommendations included:

That long-time credit (for improving and equipping farms) be extended to new settlers.

That a competent agriculturist be employed to aid and assist the settlers.

That the Secretary of the Interior fix the prices at which excess holdings are to be disposed of to settlers.

That provision be made for clearing and preparing a portion of each farm unit by the Bureau of Reclamation prior to settlement.

That settlers be selected in accordance with their experience, capital, and other desirable characteristics.

Practically the same conclusions were reached by the Owyhee board except that 1,500 new settlers would be required to settle and develop the 70,000 acres of new land in that project. The two projects will require about 2,000 farmer families to make full use of land and water.

THE PIONEERING AGE HAS PASSED

These boards realized that the value of these great undertakings to the State and Nation would depend wholly on what is done to settle the projects by good farmers and on the progress made in the development of a profitable project agriculture. They took into account that far-reaching changes had taken place in agriculture in the last 20 years. Those seeking farms at present want to know that their families will live in comfortable houses and that they will have modern tools and equipment with which to work. They want to know if they can make a satisfactory income to maintain a decent standard of living. The standard of living of the American farmer has been greatly elevated in two decades. He is no longer willing to subject his family to the discomforts of a tar-paper

shack or go to town in a two-wheeled cart drawn by a work horse. He wants living in the country to be attractive. If it is not, his family is unwilling to undertake it. He must have a car to go to town. He must have good tools and implements if he is to do his work efficiently and keep down production costs. Capital must be invested to buy labor saving machinery if he is to successfully compete with his neighbors. Twenty years ago a team, wagon, plow, harrow, and a few hand tools were all that were needed to begin farming. Few farmers now handle hay by hand from field to stack or barn. Practically all have some mechanical means of handling hay at less cost. Rarely do we see a farmer broadcasting his seed by hand or digging potatoes with a fork. The old jig pump was good enough to get water out of the well for house and feed lot. Now some form of power pump is invariably used. The list of comparisons is almost endless. The antiquated methods of the past are as dead as the kerosene lamp. Not only do people object to these old-fashioned methods of working and living, but they are extremely inefficient and uncomfortable.

In making the farm and development programs for Owyhee and Vale the boards realized that modern equipment and good farming were essential to success. They are necessary to create satisfactory earning power and human comfort and happiness, and therefore the solvency of projects.

WHAT HAS BEEN ACCOMPLISHED

How far have we progressed in making the recommendations of these boards realities? Congress has recognized that settlers to undertake the development of an irrigated farm should have some qualifications. Accordingly, settlers on irrigated public lands must now have \$2,000 in cash or its equivalent in livestock and equipment, must give satisfactory evidence to a local examining board that they have had at least two years' actual farming experience and furnish facts as to their health, character, and industry. Sufficient settlers have been selected under this plan to prove conclusively that it is far superior to the old plan of selecting settlers by lottery where frequently the least skillful or experienced was selected.

The excess lands—that is to say, areas held in a single private ownership in excess of 160 acres—have been appraised by an impartial board. These appraisals were based on the present undeveloped value of the land. These values vary from \$1 to \$15 an acre, depending on fertility of soil and the topography of the land. The average value of all the land

is fixed at about \$9 an acre. Over 80 per cent of such excess land has been signed up under binding agreements with landowners providing for sale at appraised values. Progress is being made in securing contracts for the remainder. Land held by individuals in areas of 160 acres or less was also appraised. Contracts were made with individual owners providing that if sale is made at more than the appraised value one-half of such excess value shall be turned over to the district as a credit to the cost of a water right on that particular tract of land. The effect of such appraisals and contracts with landowners will tend to curb, if not entirely eliminate speculation. A competent agent of the department trained in settlement work and the science of irrigation farming can be assigned to these projects when water is available to assist settlers in making sound economic and financial programs.

FINANCIAL AID ESSENTIAL

The boards estimated that the cost of developing and equipping a 40-acre dairy farm would amount to about \$7,500. At present, settlers with \$2,000 in capital are being approved as entrymen on irrigated public land. Where can these settlers borrow \$5,500 or even one-half that amount to bring their farms into production? Existing loaning agencies do not furnish credit to build houses and outbuildings or finance other permanent improvements on unimproved farms. The Federal land bank makes loans only on developed farms from which the income is immediate and certain. Local banks can only make short-time loans. The result is that many experienced settlers prefer to remain as tenants on thoroughly improved and developed farms, or continue in industries with a regular pay check and enjoy the necessities and comforts this provides for themselves and their families. Few are willing to subject their families to the hardships and discomforts incident to the development of sagebrush land to profitable farms with small capital and without satisfactory credit. No one is optimistic enough to believe that settlers can be secured with from \$5,000 to \$7,500 in sufficient numbers to settle these large areas of unimproved land rapidly enough to pay operation and maintenance charges and the construction charges which will follow soon after the construction of the irrigation works. Rapid settlement is dependent on securing settlers of small means.

At one time State aid in settlement was advocated, but investigation shows that in most of these States this was not possible because of constitutional prohibition

Other States did not have the means. Such aid was sought from the landowners. Most of the excess landowners are land poor and have neither the money nor credit to make loans or improve farms. Formation of corporations to do this necessary financial and development work has been considered. The conclusion was reached that money would have to be subscribed largely from the local communities. These communities are long distances from the money centers. Money is scarce and interest rates high, and few people in them have money to put into such an organization. The problem is as much unsolved now as it was when these projects were approved for construction. The Government will soon have invested in these undertakings \$22,500,000. Under the irrigation district law their cost is a first lien on the land. But if there is no one on the land those charges will not be paid. The value of that lien depends on settlement and the Government to-day has no authority to either settle the land or act effectively in promoting settlement.

TAX BURDENS

The Government should have authority to act effectively in seeing that the lands are settled. We believe also that the State should do something to aid in the settlement of these privately owned lands. The State is the chief gainer when the projects are settled. This aid should take the form of advertising and actively engaging in settlement work. Instead of receiving cooperation in this respect we find that the State is levying tribute on

this development. It is doing this by increasing taxes before irrigation is actually provided or any good has resulted from the irrigation works. Unimproved land within the Vale project is now assessed at \$4 per acre for taxing purposes, while unimproved land outside the irrigation project is assessed at \$1.50 per acre. In addition to this, a special levy of 7½ cents per acre was assessed against the irrigable lands of the Vale project.

The value of unimproved land on the Owyhee project was raised this year from \$1.50 to \$2.50 an acre. This is an increase of 66⅔ per cent. This is entirely

unjustified, because water will not be available for several years. The tax levy for school purposes in the district where the Owyhee Dam is located is 106.8 mills which has few equals in the taxing history of Oregon. These discriminations greatly add to the financial and economic burdens of these projects. Instead of assisting in making conditions attractive for settlers it will have a tendency to drive them away.

The thoughtful consideration of this group is invited to determine where and by what means a fund can be provided to assist settlers in the improvement and equipment of farms. The amounts required per farm should vary from \$2,000 to \$3,000 and should be repayable over a period of 20 years with a low rate of interest. The total amount required will not exceed 10 per cent of the cost of providing the irrigation works. Action should also be taken to abolish discriminating taxation on these project lands and consider ways and means for the State to actively aid in settlement rather than create barriers which will impair their solvency. Unless economic conditions are made more favorable the end of further reclamation of unpeopled land is not far distant.

The Egg

Quality is the great factor in market value.

A good market egg requires—

Good production methods on the farm.

Good handling methods during its journey to market.

Speed of movement from the nest to the consumer.

The best method of marketing for each producer depends upon—

Volume of egg production.

Proximity of consuming centers.

Shipping facilities.

Cost of transportation service.

Available buying or marketing agencies.

Time and labor costs required in preparation and delivery.

—Farmers' Bulletin No 1378.

IN order to encourage the feeding of sheep on the Sun River project arrangements have been made through the county agent for five boys to take 50 lambs and feed them for a period of about three months. This will make up a car-load shipment, and if the experiment is a success the same plan will be followed on a much larger scale in 1929.



A fine Holstein dairy herd on the Shoshone project, Wyo.

Deadwood Dam Construction Approved by President Coolidge

ON October 19, 1928, President Coolidge approved the construction of the Deadwood Dam, Idaho, as submitted to him in the following letter from Hon. Roy O. West, Secretary of the Interior:

THE SECRETARY OF THE INTERIOR,
Washington, October 18, 1928.

The PRESIDENT,
The White House.

MY DEAR MR. PRESIDENT: The act making appropriations for the Interior Department for the fiscal year 1928, approved January 12, 1927, provides \$416,000 for continuation of investigation and beginning construction of the Payette division of the Boise project, Idaho, and the act making appropriations for the Interior Department for the fiscal year 1929, approved March 7, 1928, provides \$400,000 for continuation of construction of this division.

Section 4 of the act of June 25, 1910 (36 Stat. 835), provides in effect that after the date of that act no irrigation project to be constructed under the act of June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplementary thereto, shall be undertaken unless and until the project shall have been recommended by the Secretary of the Interior and approved by the direct order of the President.

Subsection B, section 4, act of December 5, 1924 (43 Stat. 701), provides as follows:

"That no new project or new division of a project shall be approved for construction or estimates submitted therefor by the Secretary until information in detail shall be secured by him concerning the water supply, the engineering features, the cost of construction, land prices, and the probable cost of development, and he shall have made a finding in writing that it is feasible, that it is adaptable for actual settlement and farm homes, and that it will probably return the cost thereof to the United States."

The feature under consideration for immediate construction as a part of the

Payette division of the Boise project requiring investigation and report under subsection B, section 4, act of December 5, 1924, supra, is discussed in the order presented in that subsection.

The building and operation of the Deadwood Reservoir is an intermediate step in the carrying out of the construction of the Payette division of the Boise project, the construction of canals for the irrigation of this division to be delayed until funds therefor are available.

STORAGE PLAN

A reservoir of 160,000 acre-feet capacity is proposed on the Deadwood River, a tributary of the Payette River, 60 miles northeast of Boise, Idaho. This reservoir will be used to supply additional water for the Black Canyon Reservoir, affording a regulated flow for the power plant at Black Canyon, to be used by the Bureau of Reclamation in supplying cheap power for pumping on the Gem irrigation district and on five other districts, smaller than the Gem, whose development is threatened because of the very heavy cost of pumping, varying from \$7 to \$10 an acre. Under present conditions there is a serious shortage of water for power purposes during the peak of the irrigation season in July and August, and the output of the power plant is greatly reduced during this period. The construction of the Deadwood Reservoir will relieve this condition and make 8,000 kilowatts of firm power available throughout the irrigation season. Additional power is also needed for the construction of the Owyhee Dam and irrigation works, estimated to cost \$18,000,000. The revenues from the sale of this power are known to be ample to return the entire cost of construction of the reservoir within 40 years. Consequently there is no need of entering into contracts with irrigation

districts for the repayment of this cost, or of any other guaranties of solvency.

ENGINEERING FEATURES

The Deadwood Dam will be of arch design, 600 feet long, and 160 feet in maximum height, containing 50,000 cubic yards of concrete. The structure will be founded on granite. The Black Canyon diversion dam already constructed is a gravity section concrete structure, raising the river level 90 feet and has been successfully operated for over four years.

CONSTRUCTION COST

The estimated construction cost of the Deadwood Reservoir is \$1,200,000, of which \$800,000 has already been appropriated.

FINDING REGARDING FEASIBILITY OF PROJECT

The foregoing data justify the conclusion that the Deadwood Reservoir is feasible from an engineering and economic standpoint, and I accordingly so find and declare.

PROBABLE RETURN TO RECLAMATION FUND OF COST OF CONSTRUCTION

The next declaration required is that the cost of construction will probably be returned to the reclamation fund.

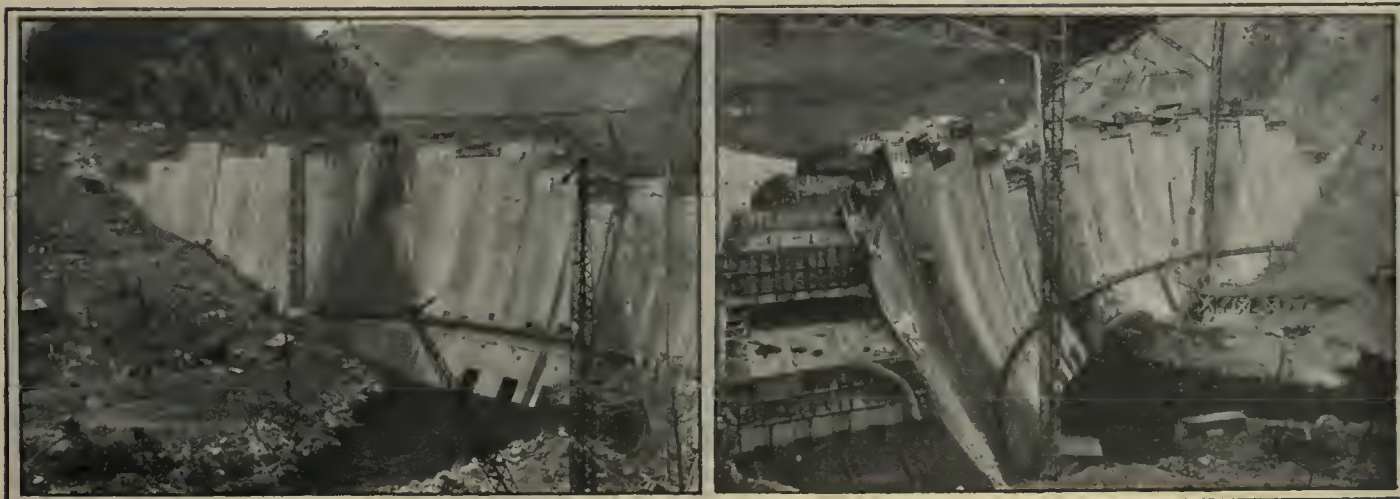
As stated above, the power revenues will be ample to return the cost of construction within 40 years. I accordingly recommend the approval of the construction of the Deadwood Reservoir and the issuance of the necessary authority to this department to make contracts for the construction and to proceed with the work.

Sincerely yours,

ROY O. WEST,
Secretary.

Approved, October 19, 1928.

CALVIN COOLIDGE,
President.



Construction progress on Gibson Dam, Sun River project, Mont.



Reclamation Project Women



By Mae A. Schnurr
Secretary to the Commissioner



Christmas Spirit

DO we ever grow away from it? Christmas is and should be a festive day. Isn't it pleasant to reflect on our childhood days, even while we are going through higher educational institutions, and live over the many pleasures that were made for us by our families and friends?

If you would enter fully into the spirit of Christmas, as a grown-up, plan and share the pleasures of the children; and how about the home maker? By a little planning the Christmas dinner can be made easier to prepare and serve. One which can be prepared ahead of time is the answer. This does not mean a cold handout for the family, either. It means selecting dishes for which work can be done one or two days before Christmas. The home maker can then spend the day in the front of the house instead of over the stove in the kitchen.

Start right off with the main course. Who needs an appetizer before turkey and fixin's? This means fewer dishes to serve and fewer to wash up, all of which require time. Besides, starting with the main course leaves more room for the festive dessert which usually accompanies a Christmas dinner.

If turkey heads the menu, prepare the bird for roasting and make the stuffing the day before. Then in a short time the turkey can be stuffed and sewed ready for the oven. Or if a fat fowl holds the place of honor, simmer it until tender the day before. About an hour before dinner time heat up the dressing which was prepared the day before, stuff the chicken, and brown it quickly in the oven. Ham for baking may be boiled a day or two beforehand, left standing in a cold place in the liquor in which it was cooked, reheated in this, then skinned, covered with bread crumbs and sugar, stuck with cloves, and put in the oven for final browning just before dinner.

White potatoes to be scalloped or sweet potatoes to be candied may be cooked the day before and arranged in a baking dish ready for the final cooking. The green vegetable—spinach, cauliflower, Brussels sprouts, or whatever it is—may be washed and prepared for the pot a day ahead of time.

Make the cranberry sauce or jelly two or three days before Christmas and set it away in a cold place. Wash the celery, wrap it well, and put it in a cold place.

Tomato aspic or grapefruit for a salad can also be fixed the day before. The lettuce and salad dressing also may be all ready for last-minute combination. Lettuce, in fact, gets crisper and more attractive if washed, covered, and let stand in a very cold place for a few hours before serving.

Plum pudding for dessert can be made days before Christmas and reheated just in time to serve. Mince pie also can be baked a day early. Or a mousse of cream and shredded pineapple or other flavoring may be packed down in ice and salt the day before and turned out in a frozen mold at dinner time. If the weather is very cold, set the mousse outdoors, and the weather will do the rest. The fruit cake to serve with the mousse was, of course, baked well in advance of the Christmas rush.

Nuts and candies help to give a festive touch and may even be arranged in the serving dishes long beforehand.

Thus with forethought most of the work of Christmas dinner can be pushed ahead and the home maker as well as the rest of the family can have a holiday on Christmas day.

Care of Food in Winter

Certain problems are presented in connection with the care of food during the winter season if ice is no longer purchased. Cooked left-overs, milk, fresh meat and fish, butter, eggs, lettuce, and other perishable foods from the market, ordinarily require low but not freezing temperatures for safe-keeping. In the properly managed refrigerator a steady, even temperature less than 50° F. but above 32° F. should be maintained. Without a refrigerator, food is subjected to the varying temperatures of the atmosphere.

Out-of-doors cold boxes for food are excellent in some ways, but they must be given proper attention. One of their chief drawbacks is unevenness of temperature. Food placed in them may some times be frozen at night, while, on the

other hand, in the middle part of the day, if the box is exposed directly to the sun, temperatures much above 50° may endanger the food that is being stored.

To protect it from contamination from dust in the air, all food stored in out-of-doors cold boxes should be put in covered receptacles. If the refrigerator is used as a winter cold box without ice, it should be placed in an unheated spot, such as the cellar or an entry, and ventilated by keeping one of the doors propped open.

Variety in School Lunches

There is apt to be a discouraging sameness about the lunches the children carry to school. Why not make sandwiches of different kinds of bread once in a while? Use whole wheat, rye or steamed brown bread sometimes in place of the usual white bread; or raisin, nut, or date bread, all of which are good with cheese filling or no filling at all. Or orange bread, made with chopped cooked orange peel. For a change omit sandwiches and include biscuits, rolls, or corn bread, or oatmeal, or bran muffins. A piece of cheese, hard-cooked egg, or a chicken drumstick may take the place of sandwich filling. The center of a roll may be hollowed out and filled with chopped meat or cooked fish seasoned with mayonnaise. A small bag of crisp potato chips is liked occasionally, and, not too often, a piece of pickle.

Salad fillings including a leaf of lettuce and any preferred dressing, always help to make ordinary sandwiches more moist. Bacon and lettuce, ground peanuts mixed with cream, tomato with mayonnaise, cooked meat cake in thin flat slices are other good fillings to vary the sliced cold meat that appears so frequently.

Be sure to season all sandwiches with sufficient salt. Cut the bread evenly, but not too thin, and spread it carefully on both sides so that the butter forms a coating that prevents the filling from soaking through. Don't get the edges smeared with butter. Butter should be creamed before it is spread on bread for sandwiches, but it should not be melted, as that makes it soak into the bread.

and Their Interests



and Associate Editor
New Reclamation Era



A whole tomato, a heart of celery, radishes, peeled Jerusalem artichokes, some chopped cabbage mixed with boiled dressing and carried in a jelly glass, raw carrot, or rutabaga are suggestions for including uncooked vegetables from time to time. Milk, it is to be hoped, is available at the school, and perhaps a hot dish. Fruit drinks are also desirable, and fruit of some kind every day. Dried fruits like figs, raisins, and dates can be used occasionally.

Put in a sweet "surprise" now and then, a new kind of cookie, a piece of chocolate, an attractive piece of cake, maple sugar, or even a few candies. Needless to say the lunch should be packed attractively and so that it will be in good condition when unpacked. Wrap each food separately in waxed paper. Pack those least likely to crush at the bottom. An extra paper napkin or paper towel to spread on the school desk adds to the comfort and daintiness of the child's meal.

Be Distinctive and Original

One of our able statesmen said once not to do things the way other people do them for that reason alone. Establish a few precedents yourself and thus be distinctive. By doing things different from the usual custom originality is encouraged and fostered. This is not only true of children but of grown-ups as well. Originality is the very foundation of progress.

Farmer's Diet Compared With That of City Worker

In his food supply the farmer has a distinct economic advantage over the city workingman with comparable income. Food consumption records collected from 1,331 families in Ohio, Kansas, Kentucky, and Missouri were studied with a view to learning what classes of foods were chiefly used by these families, and also what proportion of their food was furnished by the farm, and what part was purchased.

The families included in the study were of all sizes, ranging from 2 to 10 persons, but the average for the four States was 4.2 adult-male units. This term "adult-male unit" refers to the figure obtained by allotting different values to persons of different ages, sex, and occupations that made up these families. Hired help and relatives living with the family were allowed for in calculating, and the foods consumed by persons of various ages were estimated by means of a scale which compared the food needs of each with those of a moderately active man, or an adult-male unit. When the data were tabulated, the figures were compared with similar figures obtained in 1918 by the Bureau of Labor Statistics from about 12,000 workingmen's families.

Because of the large amounts of meat, eggs, cheese, milk, and cream furnished by the majority of the farms studied, the average farm diet furnished an ample supply of most nutrients considered necessary in a good diet, but particularly calcium and protein.

The average workingman apparently gets less of most nutritive factors than

he should, with the exception of protein, in which he just meets standard requirements. The farm diet includes an abundance of fatty foods, sweets, and cereals, but falls somewhat below the standard for fruits and vegetables. The farmer can and should raise more of these products for home use.

The workingman's family appears to consume practically all foodstuffs in smaller quantities than the farmer's family. When its figures are made comparable with those of the farm family it is seen that the workingman's food costs about 24 per cent less, but yields about 40 per cent less nutrients. It is therefore a more expensive diet, from the nutritive standpoint.

DURING the month a potato packing and shipping business was opened in Rupert, Minidoka project, handling only fancy grades of potatoes. These are, for the most part, hand picked and packed in small containers. An early shipment of tissue-wrapped Russets packed in small cartons was consigned to the Hawaiian Islands.



When the frost is on the pumpkin, Strawberry Valley project, Utah

Guernsey Dam, North Platte Project, Nebraska-Wyoming

By W. H. Nalder, Assistant Designing Engineer, Denver Office, Bureau of Reclamation

THE Guernsey Dam is a part of the North Platte Federal irrigation project of Nebraska and Wyoming and is built across the canyon of the North Platte River about 3 miles upstream from the town of Guernsey, Wyo. The Guernsey Dam provides a regulating and storage reservoir of 72,000 acre-feet capacity and also hydrostatic head for the development of 6,000 kilovolt-amperes of electrical power.

The main storage reservoir for the North Platte project is the Pathfinder Reservoir located in central Wyoming about 160 miles upstream from the point of diversion to the irrigated lands. The Guernsey Reservoir is located only 9 miles from the main point of diversion to the canals and serves as a regulating reservoir to control the water released from Pathfinder and also to store the inflow into the river between the two reservoirs. The electrical energy developed at Guernsey Dam is interconnected with the other Government power plant at Lingle, Wyo., and serves the project and the towns in the North Platte Valley between Casper, Wyo., and Scottsbluff, Nebr.

The dam site is in a comparatively precipitous canyon through which the river flows between steep hillsides. Solid rock consisting of sandstone of varying degrees of hardness, together with limestone and some shale and with occasional streaks of iron ore is generally near the surface at the dam site and is exposed in irregular cliffs over portions of the abutments for the dam. Solid rock in the stream bed lies beneath a deep layer of sand, gravel, and boulders so great as to render closure between the dam structure and the underlying bedrock impracticable. Test holes were carried to a depth of 100 feet below the stream-bed surface but failed to reach solid rock. This condition was a dominant factor in reaching decision as to the general design of the structure. The territory surrounding the dam is covered with a scattering growth of pine and cedar trees and withal presents a very picturesque setting for the structure.

THE DAM

The Guernsey Dam is a sluiced clay and sand and gravel structure with its downstream portion of heavy rock fill. It is 105 feet in height above the original stream bed, 560 feet long on the crest, and has a base width measured up and down the stream bed of 1,000 feet. The 3:1 upstream slope is protected from wave action by a 3-foot layer of dumped rock

riprap. The theoretical top width of the embankment is 20 feet. The downstream surface has a slope of 2:1 for the top 30 feet then breaks to a slope of 8:1 for the next 50 feet in elevation, from the bottom of which slope it is carried level for a maximum distance of 160 feet and terminates in a 3:1 slope to the river bed. The design first contemplated and provided for a percolation slope in the seepage water through or beneath the structure of 8:1 which was changed during construction by the addition of the level portion of the rock fill to 9:1.

The central portion of the dam is a clay-puddled core founded in an open trench 30 feet below the river bed and extended above continuously through the main embankment to the crest. The trench in which this puddled core is founded has a bottom width of 10 feet and side slopes of $1\frac{1}{2}$:1. On each side of the clay core is a sluiced sand and gravel fill and on the downstream side of the embankment is a heavy body or blanket of rock fill.

The North Platte River at the site of the Guernsey Dam has a large annual run-off, the maximum of record being about 2,636,000 acre-feet measured at the Whalen diversion dam 9 miles downstream. The maximum rate of discharge of record at this same point is about 20,800 second-feet. The river above the Guernsey Dam drains a large area in the States of Wyoming and Colorado, and it is thought that the maximum possible discharge is much greater than the recorded amounts. It was also necessary during construction to pass the required water for the irrigation of the North Platte project and to meet other vested water rights. Owing to these conditions and the fact that the construction of the dam would require more than one full calendar year it was necessary to make ample provision for caring for the river discharges during construction.

DIVERTING THE RIVER

River diversion during construction was accomplished by a large tunnel excavated through the solid rock of the right abutment about on the level with the original stream bed. This tunnel was the first work of construction. This tunnel is lined throughout with concrete and provides a net horseshoe section 25 feet in diameter for 273 feet at the intake end and 30 feet in diameter for 797 feet at the outlet end, making a total length of 1,070 feet. The designed thickness of the concrete lining was 18 inches throughout, but owing to the varying, laminated,

and seamy nature of the sandstone and limestone in which this tunnel was excavated the overbreakage was large and necessitated increasing the concrete placed in the lining by 47 per cent over the designed thickness.

The rock excavated from the tunnel was placed directly into the downstream portion of the dam by building out from the abutments across the river channel and restricting it until after the tunnel was completed and closure could be made. The tunnel muck, therefore, provided largely for the permanent dam and was used for the downstream cofferdam during the construction of the earth and gravel fill portion of the embankment. The excavation from the intake end and from the intake portal served likewise for the extreme upstream toe of the dam and for the upstream cofferdam.

Suitable concrete portal structures are provided at each end. The upstream structure provided for the permanent closure of the tunnel after its use for diversion and the downstream portal provided a suitable outlet for the permanent use of the outlet end of the tunnel for spillway and sluiceway discharges.

Upon the completion of the diversion tunnel for the passage of the river flow the upstream and downstream cofferdams were completed and the river diverted through the tunnel. The foundation for the main dam could then be unwatered and its construction proceeded with. The foundation for the dam was first stripped of all loam, brush, trees, and vegetable matter. The cut-off trench for the base of the puddled core was dug into the sand, gravel, and boulders forming the river bed to a distance of 30 feet with 10 feet bottom width and $1\frac{1}{2}$:1 side slopes. This trench was not completely unwatered, as this would have been impracticable, and the clayey material for filling it was dumped on the two sides and sluiced into place.

In order to tie the embankment into the rock abutments and prevent seepage along the planes of contact three concrete cut-off walls were provided on each side of the river channel. These walls were keyed not less than 2 feet deep into the solid rock abutments and built not less than 5 feet high above the rock surface and extended from the original river bed to the top of the dam on each side. The trenches in which these walls were placed were back filled with puddled clayey material, and this material was carried into the dam embankment over and around the tops of the cut-off walls to a minimum depth of 5 feet.

CONSTRUCTION METHODS

The construction methods used in building the main sand, gravel, and clay portion of the dam determined to a large extent a detailed composition. The borrow pits from which the main embankment material was obtained contained clay, sand, and gravel in about the right proportions for the embankment except that especially clayey material was added during construction to furnish sufficient extra clay for the puddled clay core.

The material was hauled to the dam by trains and dumped from trestles on each side of the embankment. A pool of water was maintained between these two piles of dumped material and the finer materials from them were sluiced into the pool which thus formed the puddled core and left the coarser and more gravelly material in the upstream and downstream portions of the clay, sand and gravel embankment. The trestles from which the material was dumped were brought up in several stages until the work was completed. The result is a structure conforming substantially to the original design but with considerable irregularities in the thickness and position of the puddled clay portion. Besides the material excavated from the diversion and power tunnels, the solid rock excavated from other structures, especially the north spillway, was used in completing the rock fill on the downstream portion and top of the dam. The best and most durable of this material was selected and used for the three feet of riprap on the upstream face.

The dam and power plant are reached from the outside from the higher land above the right abutment. A good road-

way was therefore excavated down to the top of the dam and the crest of the dam was made into a roadway to reach the north spillway structure. To give access to the power plant, a branch road was built onto and across the downstream side of the dam. The roads are surfaced with tailings from the Sunrise Iron Mine which is located within a few miles of the dam. A concrete bridge is provided across the north spillway channel, and it is possible that at some time in the future the top of the dam will be used as a main public highway to the country to the north and west of the dam.

The crest of the dam is reinforced with a concrete parapet wall extending 3 feet above the top of the embankment on the upstream side and with a low concrete curb on the downstream side. Between these, a roadway 26 feet wide is provided.

The designed plans called for placing an earth blanket on the reservoir floor immediately above the upstream toe of the dam. This earth blanket was partially placed as contemplated but was largely secured in a very suitable manner by the natural settling of the silt from the water due to its impounding while it was being diverted into the diversion tunnel and through the north spillway.

THE SPILLWAY

The north spillway structure is built in the solid rock of the north or left abutment of the dam. This provides the main facility for passing large flood discharges and also for the regulation of the flow of irrigation water past the dam. It has an estimated discharge capacity, with the gate wide open and the reservoir water surface at full level which is 13

feet below the top of the parapet, of 52,000 second-feet. The structure has a waterway area at the control gate of 50 by 50 feet and a trapezoidal concrete lined discharge channel 585 feet in length with a bottom width of 25 feet, side slopes of $\frac{1}{2}$:1 and depth of 40 feet. Downstream from the gate the channel is in solid rock. Upstream from the gate the dam side of the channel is formed by a vertical reinforced concrete counterforted retaining wall 66 feet high at the maximum point. The foundation rock along the toe of the retaining wall, across the channel under the control gate and behind the wing wall on the north side was pressure grouted to avoid leakage past the reservoir. The concrete lining of the spillway channel is anchored to the solid rock by $1\frac{1}{4}$ -inch anchor rods at 10-foot centers both ways grouted five feet into rock and firmly attached to the steel reinforcement in the lining consisting of $\frac{3}{4}$ -inch steel bars at 15-inch centers both ways. Four-inch diameter tile drains are provided beneath the lining on the sides and bottom at 10-foot intervals and discharge into a 30-inch square manway drain excavated beneath the lining along the center line of the channel and running from the upstream side of the control gate to the outlet end.

THE CONTROL GATE

The control gate is a structural steel vertical Stoney roller gate 50 feet 9 inches high by 54 feet $7\frac{1}{2}$ inches wide. The gate weighs 434,000 pounds and is counterweighted by concrete blocks. The gate leaf is built up of 12 plate steel girders 6 feet deep laid horizontal and suitably braced and covered on the upstream



Guernsey Dam, North Platte project, Nebr.-Wyo.

side with a $\frac{1}{16}$ -inch steel skin plate. The gate operates on six sets of caterpillar rollers on each side which run on an H-beam track. The web of the H-beam track provides flexibility to take care of any deflection in the gate or other movement that might throw the bearing surface of the rollers out of plane. Each of the three lower caterpillar roller sets contain 24 rollers of chilled cast iron 8 inches in diameter by 12 inches long and each of the three upper sets contain 15 rollers of the same size. The gate is rendered water-tight by the use of brass pipe staunching rods that move with the gate and which the water pressure forces against the 6-inch by 6-inch seal angles which are embedded in the concrete on each side of the structure.

The gate is suspended by a large metal-link chain on each side that passes through the operating machinery which is placed directly above, and returns to the counterweights that are placed in concrete chambers on each side of the gate. The chain is made up of high-tensile bronze pins 5 inches in diameter and 17 inches long spaced at 10-inch centers and connected by four lines of 1 by 9 inch high-carbon steel plate links with a combined cross-section area of 36 square inches. These chains are made with extreme accuracy, are each 66 feet 2 inches in length, and weigh 283 pounds per linear foot.

The gate-operating machinery is placed on a concrete tower structure vertically over the gate sufficiently high so that the gate can be lifted to the full opening of 50 feet. Two especially designed hoists are provided, one at each side, connected by a line shaft and actuated by an electric motor placed midway between them. A gas-engine stand-by unit is also provided. The gate operating machinery is covered by a concrete house 14 feet 6 inches wide by 72 feet long, roofed over with red clay tile and provided with a 5-ton crane for maintenance and repair work. The position of the gate can be readily controlled to within 0.01 feet and provision for its remote control is provided in the power plant at the downstream toe of the dam.

The transferring of the enormous weight of the counterweights and gate to the chains was accomplished by casting the concrete counterweights on a bed of sand that filled the counterweight chambers sufficiently to support the weights until the chain connections were made. The sand was later removed by an air jet from beneath the weights, permitting them to slowly settle until the full weight was transferred to the chains and through the hoist mechanisms to the gate.

After the north spillway structure was completed so that it could handle the river flow and the embankment completed high enough to divert the river flow

through it, the diversion tunnel on the south side was closed at its intake end. This was accomplished by first building a concrete arch that closed the portal of the tunnel from the top to within 5 feet of the floor of the intake structure. This left sufficient room for the passage of the river flow during the low stage thereof. This 5-foot opening was later partially closed by the use of 12 by 12 inch timbers placed vertically and resting in a groove in the concrete floor and finally by two 3 by 6 foot gates sunk into position to accomplish complete closure. Puddled material was later dumped in front of the closing structure to close small leaks.

DRUM GATES

An automatic spillway structure is provided on the south side by installing two 64 by 14½ foot structural steel floating drum type gates. These gates are placed on the right abutment above the diversion tunnel and discharge into a 31-foot diameter vertical shaft connecting directly to the upper end of the 30-foot diameter portion of this tunnel. The control mechanism of these gates is contained in the concrete piers at each end of the structure and in the passageways in the concrete crest structure. The estimated discharge capacity of the two gates is 30,000 second-feet with the water in the reservoir at full reservoir stage.

The automatic control of each drum gate is accomplished by a float installed in a float chamber constructed in the adjacent concrete pier, which float actuates a 24-inch needle valve which in turn controls the water pressure in the float chamber beneath the drum gates by controlling the release of water from this chamber, which is connected by a controlled opening with the reservoir above.

The intake gate and trash-rack structure for the power water is built on the hillside of the right abutment above the diversion tunnel and upstream from the automatic drum-gate spillway. The control gate is placed parallel to the hillside on a slope of 45° with the vertical and consists of a single 20 by 26 foot Stoney roller gate operating from a platform above by an electrically operated geared gate hoist connected to the gate by 6-inch diameter solid steel stems. These hoists are housed in a house 13 feet 9 inches wide by 27 feet long, similar in design to the house over the north spillway gate operating mechanisms. The trash rack is built above and beyond the gate and provides a 4,460 square feet area. The trash rack proper is made of 4 by $\frac{3}{4}$ inch steel bars spaced 3 inches apart in the clear.

The power intake structure is connected to the 25-foot diameter portion of the diversion tunnel by a concrete-lined circular shaft 20 feet in diameter.

Two permanent massive concrete plugs were placed in the original diversion tunnel. The first of these is immediately upstream from the connection of the power intake and the tunnel and furnishes the main water-tight closure of the tunnel to the reservoir water. No openings are provided through this plug.

The second plug is downstream from the first and immediately upstream from the connection between the tunnel and the shaft from the drum-gate spillway. The downstream surface of this plug is suitably shaped to provide a smooth transition between the spillway shaft and the tunnel. There are installed in this plug three 5 by 5 foot hydraulically operated slide gates. These two plugs therefore form a desilting chamber in that portion of the diversion tunnel that lies between them. Through it the power water passes with a relatively slow velocity, thus depositing its heavier silt which can be periodically sluiced out through the sluice gate in the lower plug and thence through the open tunnel below to the river below the dam. The operating mechanism for the sluice gates is contained in an inclosed chamber immediately above these gates, and access to this chamber is had by a passageway and stairs leading from the piers of the drum gate spillway structure.

POWER INSTALLATION

The power penstock proper consists of a 12-foot diameter circular concrete lined pressure tunnel leading from the desilting chamber above described through the solid rock of the right abutment past the dam to the power plant below. The center line of the power tunnel is parallel to the diversion tunnel 25 feet above and 42 feet nearer to the river from its center line. The power tunnel is 662 feet in length and its concrete lining was designed to be 10 to 15 inches in thickness. The overbreakage in the rock that was solidly filled with concrete was 42.8 per cent computed on the basis of 15-inch lining thickness. The concrete lining was placed by a 1 cubic yard gun discharging through a 6-inch delivery pipe. The concrete contained a 3 per cent admixture of diatomaceous earth based by weight on the weight of the cement content.

The power tunnel is a pressure tunnel and its concrete lining is not reinforced. Its structural integrity to support the water pressure is insured by the thorough pressure grouting of the rock surrounding it. For this purpose 111 holes were drilled into the rock to an average depth of 10 feet and spaced about 16 feet apart. The total amount of grout forced into these holes was 60 cubic yards, which is equivalent to 0.059 cubic feet per square foot of tunnel area. The grout holes were placed radially around the tunnel

after the lining was completed. Each hole was first tested with water, then with a batch of thin grout, and after this fine sand was added up to a 1:1 mixture. The grouting operations were apparently successful, as no extensive seepage from the tunnel has been detected since it was put into operation.

At its outlet end the power tunnel is connected to a steel penstock leading to the turbines in the power house. The steel penstock branches to serve the two power units, and immediately above this branch a surge tank, is provided to prevent excessive pressure rise in the long penstock. This tank is cylindrical in the shape of riveted plate steel, 22 feet in diameter, 85 feet high, and is founded on a massive concrete base.

The power house is a reinforced concrete structure 72 feet 6 inches long by 50 feet wide and 44 feet high above the main operating floor. The turbines and discharge draft tubes lie below this floor. The present installation consists of two 3,400 horsepower turbines direct-connected to two 3,000 kilovolt-ampere generators with direct-connected exciters. The turbines are designed for an average pressure head of 65 feet and a speed of 240 revolutions per minute. Electricity is generated at 2,300 volts and stepped up to 33,000 volts for long-distance transmission. The designs contemplated and provided for the future construction of a second pressure power tunnel on the opposite side of the spillway tunnel from the present one and the installation of two more power units similar to the present units in a house extended downstream from the present house whenever such additional power is deemed to be justified.

The tailrace from the power plant discharges to the tail water level of the river surface below the dam at a point upstream from the normal downstream toe of the dam. It was therefore necessary to provide special construction at this point to avoid weakening the dam and reducing its percolation factor due to this tailrace. This was accomplished by excavating the tailrace to a depth of 10 feet below its required bottom and placing thereon first an 18-inch layer of screened gravel to serve as a drain and filter for seepage water and covering all by an 8-foot 6-inch layer of heavy rock fill.

The Guernsey Dam and power plant were constructed under contract by the Utah Construction Co. Work was commenced in May, 1925, and completed in January, 1928. The principal items and approximate quantities of work involved in the main contract for the dam, tunnels, and spillways only were as follows:

Excavation, all classes, most of which entered the rock-fill portion of the dam, 223,300 cubic yards.

Clay, sand, and gravel embankment, 365,000 cubic yards.
Pressure grout holes, 3,540 linear feet.
Drain pipe, 3,850 linear feet.

Concrete, 22,200 cubic yards.
Reinforcing steel, 757,000 pounds.
Structural steel and machinery, 2,833,000 pounds.

Exhibit by W. T. Peyton Riverton Project, Wyo.

ON his recent visit to the Riverton project, while inspecting the exhibits at the county fair, Secretary West was much pleased with the exhibit of products raised on the project by W. T. Peyton, gatekeeper at the Wind River diversion dam. Mr. Peyton farms a small tract of about 4 acres a short distance below the diversion dam. The following premiums were taken by Mr. Peyton for his exhibits at the fair:

First.—Sweet corn, green; Marquis wheat; barley with hull; other spring wheat (sheaf); Sudan grass (sheaf); alfalfa, second cuttings (sheaf); sweet clover, white (sheaf); Bliss Triumph potatoes (table); Russett Burbank potatoes (table); Red McClure potatoes (table); display three varieties potatoes (table); Red McClure potatoes (seed); Russett Burbank potatoes (seed); white Bermuda onions; beets for table use; turnips for table use; mangel wurzels; parsnips; Swiss chard; cauliflower; oyster plants; table peas, shelled; red raspberries.

Special.—Largest number of ribbons in vegetable classes.

Second.—Individual farm booth; white oats; beardless barley (sheaf); alfalfa, first cutting (sheaf); sweet clover, yellow

(sheaf); general sheaf exhibit; general threshed grain exhibit; Irish cobbler potatoes (table); Bliss Triumph potatoes (seed); Irish cobbler potatoes (seed); sugar beets; muskmelons; celery; cabbages, late; strawberries.

Third.—Soft spring wheat; soft spring wheat (sheaf); yellow Bermuda onions; summer squash; crookneck squash; spinach for table use; lettuce, head; compass cherry.

Mrs. Peyton also obtained the following premiums for her exhibits:

First.—Canned rhubarb; canned fish.

Second.—Canned cauliflower; canned greens; canned cherries; canned gooseberries; canned raspberries; snapdragons.

Third.—Nasturtiums.

The best of the exhibits at the county fair were taken to the State fair at Douglas. At that fair the following premiums were received for Mr. Peyton's produce:

First.—Russett Burbank potatoes (seed); largest stock carrot.

Second.—Red McClure potatoes (table); Russett Burbank potatoes (seed); Red McClure potatoes (seed).

Third.—Russett Burbank potatoes (table); late cabbage.



Cut on High Line Canal, Uncompahgre project, Colo.

Grasshopper Control Campaigns on Tule Lake Lands, Klamath Project, Oregon-California

By H. D. Newell, Project Superintendent, and C. A. Henderson, County Agent

DURING 1907, when the water surface of Tule Lake was at a high elevation, the lake covered an area of 150 square miles. In 1908-9 the United States built Clear Lake Reservoir, thus impounding the greater portion of the flood flow of Willow Creek, which, prior to that time, had entered Tule Lake. As soon as the flood flow began to be impounded in Clear Lake Reservoir, the water surface elevation in Tule Lake began to lower because of the effect of evaporation. In 1912-13, the diversion channel was built, through which Lost River water was diverted into Klamath River. The result of the construction of the diversion channel was to divert into Klamath River up to about 300 second-feet of the flow of Lost River which, prior to that time, had flowed into Tule Lake. From the time of the construction of the diversion channel, the water surface elevation of Tule Lake began to lower steadily at the rate of nearly 2 feet vertically every year. As the water receded, the land marginal to the lake was used for growing grain. By 1919 the water surface area had been reduced to about 100 square miles, surrounding which were several thousand acres of grain and other thousand acres of dry land not cultivated. Conditions were, therefore, extremely favorable for grasshopper infestation, as large areas were uncultivated and abundant food was available.

Grasshoppers have been present on Tule Lake lands in more or less serious

quantities since the lake was drained to its present low point about seven years ago. Poisoning has been carried on by lessees in cooperation with Klamath County and the Bureau of Reclamation. However, extermination was never secured, owing first, to apathy of lessees; second, lack of sufficient funds; third, difficulty in securing cooperation in a district involving two States, three counties, privately owned land, and leased Government land; fourth, the 1-year leases.

During certain years damage was serious, which usually resulted in a fairly active campaign the following year with much smaller damage. Supplies were furnished by the Bureau of Reclamation and Klamath County, mixing and spreading being done by lessees under supervision of the Klamath County agent.

INFESTATION

Grasshopper infestation was particularly heavy in 1928, extending completely around Tule Lake and involving considerable bottom land. Eggs were deposited the previous fall on the old shore line and flats surrounding the lake bottom, and also on the more compact soil of the lake bottom itself. The circle of infestation was about 35 miles in length. It is believed that a large part of the eggs laid in 1927 were from hoppers that had previously hatched out on lands south and southeast of Tule Lake.

The area actually infested was approximately 25,000 acres. A large amount of

idle or pasture land provided an ideal hatching bed, making fighting difficult, inasmuch as the entire lake bed, comprising 90,000 acres, was more or less infested.

IMPORTANCE OF CONTROL

With the homesteading of thousands of acres of Tule Lake, complete control of grasshoppers became necessary owing to damage sustained annually by homesteaders on the units bordering the leased land. Although this damage did not reach any excessive figure, homesteaders getting started could ill afford to have crops destroyed. The grasshopper situation appeared so serious this spring that it was realized that every effort of control must be made in order to complete the homesteading program as planned by the Bureau of Reclamation.

1928 CAMPAIGN

Considerable loss was experienced in 1927 by grasshopper depredations, resulting in a further request for financial assistance from the bureau. This money was used in locating egg beds on the lake lands. However, most of the upland country was overlooked, and 75 per cent of this year's crop hatched out on the lands above and adjacent to Tule Lake. Cultivation was undertaken on the bottom lands during the fall of 1927 and spring of 1928, with good results. On the rocky shore line this could not be done, and plans were made for poisoning at hatching time. Grasshoppers started hatching the 1st of May, 1928, and continued for eight weeks. A machine poison mixer was constructed and put in operation at the Dalton Rimrock camp on Tule Lake, and a poisoning crew hired. Mixing started May 12 and continued daily until July 20. During a part of this period the mixer was operated two shifts, with a capacity of 30,000 pounds bran mash a day. The formula used was as follows:

- 2 sacks bran.
- 12 pounds commercial white arsenic.
- 3 gallons molasses.
- 3 tied sacks sawdust, fine.
- 4 ounces amyl acetate.

This formula was varied slightly, sodium arsenite being tried out, but the above formula gave best results.

Three field men were employed, each with a poisoning crew to locate hoppers, check egg beds, and superintend poisoning operations in their respective districts. The maximum crew was 30 during the height of the infestation and a



Grasshopper poison mixer, July 16, 1928



Advance of grasshoppers stopped, August 3, 1928

smaller number later in the season. Lessees cooperated in furnishing men and trucks. Poisoning was supervised as closely as possible, the best results being secured in early morning and late afternoon poisoning. It was somewhat difficult to make lessees use the proper amount of poison as they all attempted to spread much more than was necessary.

Posioning was first done on the egg beds, later in the grain fields, and during July egg-laying grounds were poisoned where eggs were being deposited. The latter was a new departure from old poisoning methods, but gave particularly good results. Check was made on kills and counts of over 500 dead grasshoppers per square foot were made on large areas.

RESULTS

It is estimated by lessees that from 90 to 95 per cent of all grasshoppers have been killed by poisoning and that all crops still remaining can be attributed to the active poisoning campaign.

Survey of the crop situation shows 14,000 acres of excellent grain that will be harvested, 4,000 acres of grain hay, and an additional 4,000 acres of excellent alfalfa, besides smaller acreage of potatoes and miscellaneous garden truck crops and pasture on the leased lands and homesteads of Tule Lake.

COMPLETION OF CAMPAIGN, SPRING OF 1929

The control campaign as outlined this spring calls for completion during spring of 1929. Although poisoning operations have been discontinued, three field men have been retained, each with a separate surrounding the lake. On those beds that district, and all egg beds in their respective districts will be checked and plotted, both

on the lake bottom itself and on the rim can be cultivated lessees will be requested to do this this fall and spring. Poisoning materials will be on hand and an active poisoning campaign started on the egg beds at hatching time next year. It is believed that by starting early hoppers can be confined entirely to the egg beds, with no crop loss resulting. If this can be done it is believed that the grasshopper menace will be practically at an end.

COOPERATING AGENCIES

The following agencies cooperated in carrying out the present control program: United States Bureau of Reclamation, Klamath County, Oregon Agricultural College Extension Service, Tule Lake lessees, and homesteaders.

POISONING MATERIALS USED

Materials used during the poisoning campaign were as follows:

5,500 sacks sawdust.
60,000 pounds molasses.
100 gallons amyl acetate.
4,500 sacks bran.
20,000 pounds arsenic.

This material was made into a fine mash with the addition of water and spread over the infested territory at the rate of 15 pounds to 50 pounds per acre. Repoisoning was required every second or third day during the hatching period. It was necessary to poison more than 20,000 acres.

CROP LOSS

Considerable damage was experienced on the dry lands, but the majority of this was due to drought and frost, with the assistance of grasshoppers. Approximately 1,200 acres of good grain were

destroyed in addition to the upland pasture and hay land.

RECOMMENDATIONS

1. Smaller leases would be advantageous, if possible, as some of the present leases are so large that lessees can not cooperate successfully in controlling the hoppers.

2. A definite grasshopper-control clause should be contained in all future leases and contracts.

3. Consideration should be given applications of lessees for water, where this can be done without additional work on the part of the Bureau of Reclamation. A number of lessees have large leases well removed from the subirrigated area near the lake, and experience has shown that these leases will not produce sufficiently to warrant their retention. If water could be provided for a small per cent of the total lease, this would provide sufficient hay so that lessee could afford to keep the lease and pasture the remainder. This policy would be beneficial both to the lessee and the lessor.

4. If the homestead program could be speeded up, the grasshopper-infested territory would be reduced, making control much easier, as grasshoppers can be easily controlled on cultivated land

Washington Irrigation Institute Convenes

Changes in the irrigation district laws of the State of Washington, to promote the welfare of irrigation farmers, will be discussed in the main session of the Washington Irrigation Institute at its meeting at Ellensburg on November 14 and 15. A committee of the institute, of which E. F. Benson, agricultural development agent of the Northern Pacific Railway, is chairman, and including the best irrigation authorities in the State, will report on suggested amendments to the law.

H. M. Gilbert, of Yakima, is president of the institute and T. B. Hill, of the Washington State Chamber of Commerce, Seattle, is secretary.

THE Mini-Cassia Cow Testing Association, comprising the Minidoka project, led the State of Idaho during September with a butterfat production of 27.9 pounds per cow. Of 92 associations in the United States only 5 exceeded the average of the project during that month.

Productive Irrigation at Owyhee Dam Camp

By C. A. Betts, office engineer, Owyhee project, Nysso, Oreg.



The camp at the Owyhee Dam site, Owyhee project, Oreg.-Idaho

VISITORS this summer at the Owyhee Dam camp of the Bureau of Reclamation refused to believe that the luxuriant gardens of the well-landscaped Government camp occupied plots which had been sand and weeds a few months previously. The transformation of Owyhee camp into a beautiful garden spot shows what proper irrigation can accomplish and reflects credit upon the industry of the employees whose good-natured rivalry made such quick results possible.

In March of this year grading of the camp was finished where a year before there had been a few tents occupied by the engineers and diamond drill crew who were testing the dam site. Looking forward to this time a plan of the permanent camp had been prepared and trees planted along the proposed streets and back fence lines in 1927. These included globe locusts on the side of the street nearest the houses, poplars on the side near the river, and elms along the highway west of camp—all irrigated by a small gasoline pump from the river.

During the winter the camp sewer and water supplies were installed preparatory to spring planting. Separate systems were provided for the domestic supply and for irrigation and fire protection. In this way irrigation water could be furnished more cheaply by pumping directly from

the river by a low head pump relieving the deep-well (100 feet through rock) pumps, that served the gravity reservoir, of this variable load. This plan had the merit of providing double fire protection

and plenty of water for the gardens. A 10-horsepower Deming pump, 800 feet of 4-inch wood-stave pipe, and about 1,000 feet of $\frac{3}{4}$ -inch iron-pipe laterals constituted the combination system.

Each of the yards within the Government inclosure has a 15-foot parking strip and a 15-foot front yard planted to blue grass and white clover in equal proportions. Many kinds of flowers and vines were planted around the houses according to the taste of the occupants. In the back yards a garden plot of about 2,000 square feet was planted with vegetables and fruit.

These produced unexpected returns so that, within a few weeks after planting, the favorite outdoor sport of the camp was exchanging gifts of delicious fresh vegetables. Crops included strawberries, raspberries, blackberries, loganberries, dewberries, grapes, cantaloupes, watermelons, rhubarb radishes, lettuce, peas, beans, sweet corn, beets, carrots, turnips, potatoes, cabbage, onions, asparagus, parsley, pumpkins, squash, celery, tomatoes, and sugar cane, as well as fancy varieties.

It was found that perennials, which usually bloom the second season, developed the first year under the hot sun of the Owyhee Valley (maximum temperature 110°) and the careful gardening of the reclamation staff. Beets and squash as large as basket balls, 1,600 bushels of onions to the acre, and many other evidences of favorable growing conditions promise high yields for 1929.



Open drain No. 10, Huntley project, Mont., before and after being cleaned and deepened by drag line

Minidoka Project Holds Fair and Seed Show

More than 80 farmers of the Minidoka project, Idaho, recently exhibited the choicest of their grain and seed products at a miniature fair sponsored by the Minidoka County Bank of Rupert, Idaho, and under the supervision of B. E. Kuhns, county agent.

Of especial interest was the red-clover seed exhibit which was featured by 20 entries, most of which were so free from weed seeds and other varieties and of such lustrous color and fine quality that the judge had a difficult task in placing them.

Unusual interest, too, was evidenced in the bean section of the show. A dozen growers of the favorite Montana white bean vied for honors here.

The exhibits from the seed potato section were all from fields grown under State inspection for certification.

The finest of these entries will be entered in the State Seed Show to be held at Rexburg and the National Hay and Grain Show at Chicago.

A section of the exhibit is shown in the accompanying illustration.



Miniature fair and seed show, Rupert, Minidoka project, Idaho

Purebred Dairy Sires Are Good Investment

Records of dairy herd improvement associations in all parts of the United States show how rapidly a good dairy sire can increase the production of a herd of average cows. Cows in these herds having an average yearly production of 4,695 pounds of milk and 179 pounds of butterfat and mated to purebred sires produced daughters that averaged 7,607 pounds of milk and 300 pounds of butter-

fat, a gain in one generation of 2,912 pounds of milk and 121 pounds of butterfat.

This increase in butterfat production, at 50 cents a pound, is worth about \$60. Allowing about 25 per cent for the extra feed required for the higher production, the value of the net gain per daughter due to the purebred sire would be about \$45. A purebred bull would need to sire only a few such daughters to pay for himself, and the yearly income would be increased by an amount equal to \$45 multiplied by the number of his producing daughters.

THE water users' association of the Orland project reports full payment of the 1926, 1927, and 1928 assessments, resulting in all outstanding charges to date being paid.



Irrigated alfalfa, Orland project, Calif.

Reclamation Organization Activities and Project Visitors

DR. ELWOOD MEAD, Commissioner of Reclamation, appeared before the subcommittee of the House Committee on Appropriations in charge of appropriations for the Interior Department during November in justification of the Budget estimates for the work of the bureau.

D. C. Henny, consulting engineer, was a recent visitor at the Washington office.

Paul J. Leverone, former engineer draftsman in the Washington and Denver offices and in a number of the project offices, has recently become the president and owner of the Columbia School of Drafting and Engineering of Washington, D. C. After 10 years of service with the bureau Mr. Leverone resigned to become chief draftsman of the National Park Service, resigning after six years' service to become chief draftsman for the firm of Brock & Weymouth of Philadelphia, Pa. While in their employ he received an offer from the Rand McNally Map Publishing Co., of Chicago, to become the chief draftsman of their New York office, and while considering this offer the opportunity presented itself for him to become president and owner of the Columbia School where he received his first training as a draftsman.

George C. Kreutzer, director of reclamation economics, and **C. A. Bissell**, chief of the engineering division of the Washington office, returned to the office on October 26 after an extended trip to the South with particular reference to opportunities for planned group settlement in North Carolina and Florida and drainage of the Yazoo Delta, Miss. They were accompanied on the trip by **J. R. Iakisch**, drainage engineer; **S. L. Jeffords**, special investigator of land settlement and reclamation; and **S. G. Hearne**, soil expert. Mr. Kreutzer is planning to address the American Railway Development Association in Chicago, on December 7, on the subject of the status of reclamation work in the United States.

W. W. Schlecht, former superintendent of the Yuma project, was a recent caller at the Washington office. Mr. Schlecht has spent the past five years in Porto Rico on the installation of a large power development, and is now connected with a \$15,000,000 Government power development in the Canal Zone.

T. R. Smith, assistant engineer in the drafting division of the Denver office, has been transferred to the Salt Lake Basin project, Utah.

Fredrik Vogt, consulting engineer, is working up a detailed report in the Denver office on the results of tests on the model of the Stevenson Creek Dam, after the completion of which it is planned to build a model of the Gibson Dam and test it under a mercury load.

S. O. Harper, general superintendent of construction, visited the Sun River, Minidoka, Vale, and Owhyee projects during the month.

On October 27 the water users of the Orland project held a celebration at Orland on the completion of the Stony Gorge Dam. Distinguished visitors included Congressman **Clarence F. Lea**; **Edward Hyatt, jr.**, State engineer; **Fred C. Scoby**, irrigation engineer, Department of Agriculture; **A. N. Burch**, engineer; **Frank Adams**, professor of irrigation practice of the University of California; and **Van Bernard**, assemblyman, California State Legislature.

L. R. Fiock, superintendent of the Rio Grande project, was a visitor on the Orland project recently.

W. D. Funk, chief clerk on the Okanogan project, has been transferred to the Minidoka project.

E. R. Crocker, engineer from the Denver office, spent some time on the Sun River project on designs and estimates connected with canal relocation.

Walter J. Hunt, **B. M. Baligrodsjke**, and **Irving J. Courtice**, of the agricultural and immigration departments of the Northern Pacific Railway, were recent visitors on the Lower Yellowstone project.

C. M. Day, mechanical engineer from the Denver office, has made an inspection of the outlet works at Minitare Dam, North Platte project, and visited the Belle Fourche project in connection with the overhauling of the balanced valves in Belle Fourche Dam.

George A. Bonnet, personnel clerk from the Denver office, visited the Rio Grande project recently.

R. L. Ripple, State Fish Commissioner of South Dakota, visited the Belle Fourche project recently for a conference on seining operations in Belle Fourche Reservoir.

The members of the Utah Water Storage Commission visited Echo Dam, Salt Lake Basin project, during the month.



Outlet of Gunnison Tunnel and South Canal, Uncompahgre project, Colo.

ADMINISTRATIVE ORGANIZATION FOR THE BUREAU OF RECLAMATION

HON. ROY O. WEST, SECRETARY OF THE INTERIOR

E. C. Finney, First Assistant Secretary; John H. Edwards, Assistant Secretary; E. O. Patterson, Solicitor of the Interior Department;
E. K. Burlew, Administrative Assistant to the Secretary

Washington, D. C.

Elwood Mead, Commissioner, Bureau of Reclamation

Miss M. A. Schnurr, Secretary to the Commissioner

P. W. Dent, Assistant Commissioner

George O. Kreutzer, Director of Reclamation Economics

W. F. Kuhach, Chief Accountant

C. A. Bissell, Chief of Engineering Division

Hugh A. Brown, Assistant Director of Reclamation Economics

C. N. McCulloch, Chief Clerk

Denver, Colorado, Wilda Building

R. F. Walter, Chief Engineer; S. O. Harper, General Superintendent of Construction; J. L. Savage, Chief Designing Engineer; E. B. Dehler, Hydrographic Engineer; L. N. McClellan, Electrical Engineer; C. M. Day, Mechanical Engineer; Armand Offutt, District Counsel; L. R. Smith, Chief Clerk; Harry Caden, Fiscal Agent; C. A. Lyman, Fiscal Inspector.

Project	Office	Superintendent	Chief clerk	Fiscal agent	District counsel	
					Name	Office
Belle Fourche.....	Newell, S. Dak.....	F. C. Younghlutt.....	J. P. Siehenelcher.....	.....	Wm. J. Burke.....	Mitchell, Nehr.
Boise ¹	Boise, Idaho.....	R. J. Newell.....	W. L. Vernon.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Carlshad.....	Carlshad, N. Mex.....	L. E. Foster.....	W. C. Berger.....	W. C. Berger.....	H. J. S. Devries.....	El Paso, Tex.
Grand Valley.....	Grand Junction, Colo.....	J. C. Page.....	W. J. Chiesman.....	.....	J. R. Alexander.....	Montrose, Colo.
Huntley ²	Ballantine, Mont.....	E. E. Lewis.....	.....	.....	.....	.....
King Hill ³	King Hill, Idaho.....	F. L. Kinkaid.....	.....	.....	.....	.....
Klamath.....	Klamath Falls, Oreg.....	H. D. Newell.....	N. G. Wheeler.....	Joseph C. Avery.....	R. J. Coffey.....	Berkeley, Calif.
Lower Yellowstone.....	Savage, Mont.....	H. A. Parker.....	E. R. Scheppelmann.....	E. R. Scheppelmann.....	E. E. Roddis.....	Billings, Mont.
Milk River.....	Malta, Mont.....	H. H. Johnson.....	E. E. Chahot.....	E. E. Chahot.....	do.....	Do.
Minidoka ⁴	Burley, Idaho.....	E. B. Darlington.....	G. C. Patterson.....	Miss A. J. Larson.....	B. E. Stoutemyer.....	Portland, Oreg.
Newlands ⁵	Fallon, Nev.....	A. W. Walker.....	.....	Miss E. M. Shummonds.....	R. J. Coffey.....	Berkeley, Calif.
North Platte ⁶	Mitchell, Nehr.....	H. C. Stetson.....	Virgil E. Huhbell.....	Virgil E. Huhbell.....	Wm. J. Burke.....	Mitchell, Nehr.
Okanogan.....	Okanogan, Wash.....	Calvin Casteel.....	.....	N. D. Thorp.....	B. E. Stoutemyer.....	Portland, Oreg.
Orland.....	Orland, Calif.....	R. C. E. Weber.....	C. H. Lillingston.....	C. H. Lillingston.....	R. J. Coffey.....	Berkeley, Calif.
Owyhee.....	Nyssa, Oreg.....	F. A. Banks.....	H. N. Bickel.....	Frank P. Greene.....	B. E. Stoutemyer.....	Portland, Oreg.
Rio Grande.....	El Paso, Tex.....	L. R. Flock.....	V. G. Evans.....	L. S. Kennicott.....	H. J. S. Devries.....	El Paso, Tex.
Riverton.....	Riverton, Wyo.....	H. D. Comstock.....	R. B. Smith.....	R. B. Smith.....	Wm. J. Burke.....	Mitchell, Nehr.
Salt River ⁷	Phoenix, Ariz.....	C. C. Cragin.....	.....	.....	.....	.....
Shoshone ⁸	Powell, Wyo.....	L. H. Mitchell.....	W. F. Sha.....	.....	E. E. Roddis.....	Billings, Mont.
Strawberry Valley ⁹	Payson, Utah.....	Lee R. Taylor.....	.....	.....	.....	.....
Sun River ¹⁰	Fairfield, Mont.....	G. O. Sanford.....	H. W. Johnson.....	H. W. Johnson.....	E. E. Roddis.....	Do.
Umatilla ¹¹	Irrigon, Oreg.....	A. C. Houghton.....	.....	.....	.....	.....
Uncompagre.....	Hermiston, Oreg.....	Enos D. Martin.....	.....	.....	.....	.....
Vale.....	Montrose, Colo.....	L. J. Foster.....	G. H. Bolt.....	F. D. Helm.....	J. R. Alexander.....	Montrose, Colo.
Yakima.....	Vale, Oreg.....	H. W. Bashore.....	C. M. Voyer.....	C. M. Voyer.....	B. E. Stoutemyer.....	Portland, Oreg.
Yuma.....	Yakima, Wash.....	P. J. Preston.....	R. K. Cunningham.....	J. C. Gawler.....	do.....	Do.
.....	Yuma, Ariz.....	R. M. Priest.....	H. R. Pasewalk.....	E. M. Philbaum.....	R. J. Coffey.....	Berkeley, Calif.

Large Construction Work

Salt Lake Basin, Echo Dam.....	Coalville, Utah.....	F. F. Smith ¹²	C. F. Williams.....	C. F. Williams.....	J. R. Alexander.....	Montrose, Colo.
Kittitas.....	Ellensburg, Wash.....	Walker R. Young ¹³	E. R. Mills.....	.....	B. E. Stoutemyer.....	Portland, Oreg.
Sun River, Gibson Dam.....	Augusta, Mont.....	Ralph Lowry ¹⁴	F. C. Lewis.....	F. C. Lewis.....	E. E. Roddis.....	Billings, Mont.

¹ Operation of Arrowrock Division assumed by Nampa-Meridian, Black Canyon, Boise-Kuna, Wilder, Big Bend, and New York Irrigation Districts on Apr. 1, 1926.

² Operation of project assumed by Huntley Project Irrigation District on Dec. 31, 1927.

³ Operation of project assumed by King Hill Irrigation District Mar. 1, 1926.

⁴ Operation of South Side Pumping Division assumed by Burley Irrigation District on Apr. 1, 1926, and of Gravity Division by Minidoka Irrigation District on Dec. 2, 1916.

⁵ Operation of project assumed by Truckee-Carson Irrigation District on Dec. 31, 1926.

⁶ Operation of Interstate Division assumed by Pathfinder Irrigation District on July 1, 1926, Fort Laramie Division by Goshen Irrigation District and Gering and Fort Laramie Irrigation District on Dec. 31, 1926, and Northport Division by Northport Irrigation District on Dec. 31, 1926.

⁷ Operation of project assumed by Salt River Valley Water Users' Association on Nov. 1, 1917.

⁸ Operation of Garland Division assumed by Shoshone Irrigation District on Dec. 31, 1926.

⁹ Operation of project assumed by Strawberry Water Users' Association on Dec. 1, 1926.

¹⁰ Operation of Fort Shaw Division assumed by Fort Shaw Irrigation District on Dec. 31, 1926.

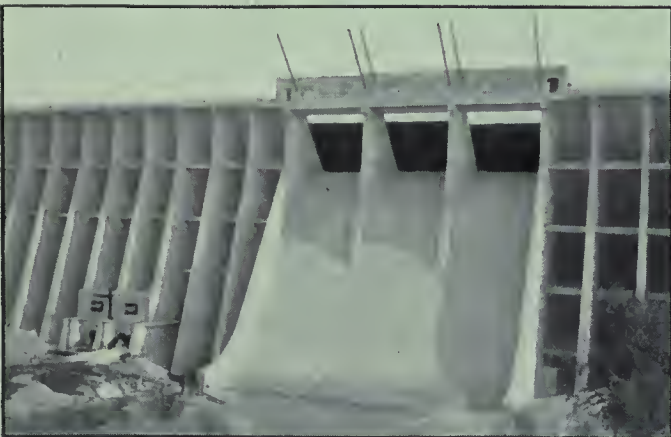
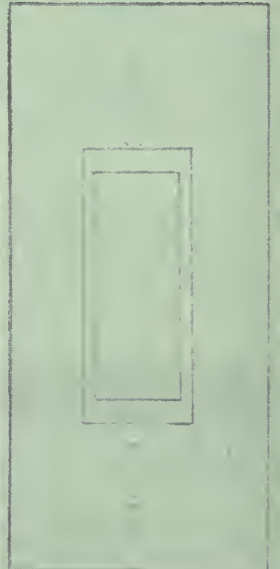
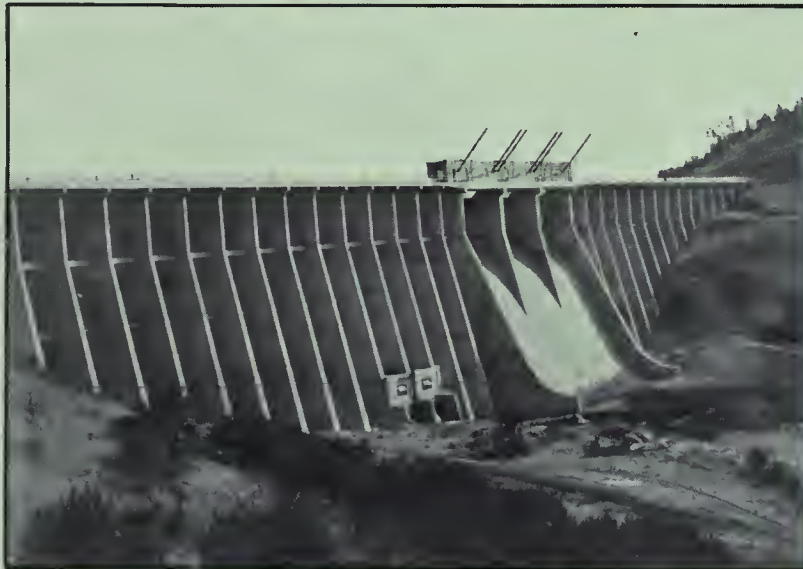
¹¹ Operation of West Division assumed by West Extension Irrigation District on July 1, 1926, and East Division by Hermiston Irrigation District informally on July 1, 1926, and formally, by contract, on Dec. 31, 1926.

¹² Construction engineer.

Important Investigations in Progress

Project	Office	In charge of—	Cooperative agency
Middle Rio Grande.....	Denver, Colo.....	.....	Middle Rio Grande conservancy district.
Heart Mountain investigations.....	Powell, Wyo.....	I. B. Hosig.....	.....
Utah investigations.....	Salt Lake City, Utah.....	E. O. Larson.....	State of Utah.
Truckee River investigations.....	Fallon, Nev.....	A. W. Walker.....	.....

VIEWS OF STONY GORGE DAM



ORLAND IRRIGATION PROJECT, CALIFORNIA.

